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The railway situation in Congress grows more and more confused, and at this writing the majority, pledged to carry out the proposals of the Republican platform, as formulated by President Taft, does not know whether it is a majority or not. The uncertainties of the last two months, as noted in our news columns weekly and in the editorial column March 25 and April 1, are more pronounced than ever, except that increasing confusion makes probable the failure of all railway legislation. Each of the President's principal proposals—to establish a special court, to permit consolidations under certain conditions, to permit traffic agreements between competing roads, and to regulate railway capital issues—has been virtually rejected in one house or the other, at one time or another. The votes which have been taken in the House have been in Committee of the Whole, and may not indicate accurately the final sentiment of the members; but the significant fact is that the opponents of the President's measures, believing that the first three of them are too favorable to the railways, have determined to block their passage, and to emphasize their opposition they have brought in two others which they are sure will hurt the railways, the long-and-short-haul provision and the valuation of the physical property of all railways. They seem to have the votes to carry their proposals, or at least enough to throw all questions into a conference between the two houses, where the whole bill could be easily killed. The proposition to regulate capital has enemies on both sides, because of its real or supposed infringement of State rights. It is plain that there is no intelligent and well-settled public sentiment behind any of these propositions, and, therefore, it can hardly be called a misfortune if all of them fail. The people should be satisfied with non-action, because they do not know what they want, and the railways had not expected astonishing benefits in any event.

With the granting of a charter to the Southern New England to connect the Grand Trunk system with Providence, R. I., by a line from Palmer, Mass., the Canadian corporation's new invasion of southern New England territory and the seaboard may be said to have advanced nominally another step. It remains to be seen whether the Grand Trunk actually builds the new line or uses its charter as a "big stick" to knock out concessions for itself. The stick itself is not so formidable a weapon for railway polemics as the original charter seemed to portend; for the charter, as a legislative fact, has been hedged about with costly if not deadly restrictions. There are restrictions of grade crossings; restrictions bearing on the use of the rival New Haven's terminals and terminal approaches; and, in general, the consequential obstacles always existing when a new line seeks entry into populous urban territory. The obstructions, indeed, are such that Grand Trunk authority has been quoted to show that it may have to appeal for future charter easements. Also, the cost of the proposed line is not likely to be less than $8,000,000 or $10,000,000, complicated with the Grand Trunk's financing of its Pacific extension. Meanwhile come foreshadowings of New Haven counter-strokes by cutting out the Grand Trunk's connecting links in the Boston & Maine north of Springfield, Mass. In brief, the situation in New England places the New Haven and Grand Trunk in attitudes of gesticulation with weapons raised to strike; but a treaty is more likely than a blow. It is a familiar pose, with conditions pointing to a revival of the negotiations of a year or so ago looking toward traffic agreements by which the Grand Trunk acquires rail access to New York City via the New Haven.

The Prussian minister of railways, in explaining the cause of a collision, talks exactly like certain railway men to be found in other parts of the world—not so far away as Prussia. A summary of this minister's remarks on the Mulheim collision is given in another column: the experience of the Prussian railways with automatic stops has been unsatisfactory, and at best an automatic stop makes enginemen less alert; experiments with audible cab signals are "under way," but how these will turn out remains to be seen; experiments with automatic registering apparatus, to reveal to the superintendent every instance of overrunning a signal have been begun; and, finally, careful selection and training of engine-

men is the most hopeful direction in which to make improvement. Calmness, presence of mind and ingrained devotion to duty are the qualities desired. Whether the "Opposition" in the Prussian Landtag devotes its ingenuities to picking flaws in the ministers' statements we do not know; but there are some obvious things which a member of the opposition might have said on this occasion. In considering "unsatisfactory" experience with automatic stops the very satisfactory experience with stops on the thousands of express trains of the Interborough Rapid Transit in New York City for five years past ought to be mentioned. The reasons why this experience is worthless in Prussia ought to be stated. As to automatic stops causing enginemen to be less alert, the Interborough people will probably testify that this supposed weakness gives them no serious trouble. When a railway manager does not know what to expect from an audible cab signal he should be asked if he has heard from England, where the Great Western Railway has used such signals with considerable satisfaction for three or four years. Automatic apparatus to register all of an engineman's errors in reading signals is attractive in theory, but Minister von Breitenbach's experimenters probably will tell him that expenditures of time and money in this direction give far less promise of useful results than those in the other directions suggested. And, finally, if selection and training of men is the most important thing to be attended to, the public would like to know, no doubt, just what degree of progress has been and is being made toward perfection in this respect. Ingrained devotion to duty is excellent as an ideal and also is exemplified in practice by thousands of employees, but if Germany is at all like America there should be added one more ideal: *intelligent* devotion to duty. The most deplorable railway disasters are those which are due to error or neglect on the part of an employee who was wholly devoted but was not highly trained.

CONCRETE CULVERT CONSTRUCTION.

Two types of concrete slabs for flat top culverts and short span bridges are in common use. The one most frequently used consists of I-beams encased in concrete; the other is reinforced concrete. In the I-beam construction, the concrete does not add strength, its purpose being to protect the steel and furnish a rust-, decay,- and fireproof deck for ballast. The steel is designed to carry the entire load of track and traffic in addition to the weight of the concrete. Such construction is wasteful, and, also, it is questionable whether or not the concrete encasement is actually a protection for the steel. It is believed by many competent engineers to be in reality a detriment. The large flat surfaces of the steel beams are not ideal for obtaining perfect adhesion to concrete, and the vibration necessarily set up soon destroys such adhesion as may exist. When separation occurs, the concrete immediately above and below the steel is sheared, and all such slabs have cracks plainly denoting the position of each beam. The cracks are indicated by lines of rust running to the surfaces of the concrete and water leaks into and through the slabs along these cracks.

Rust takes up more room than uncorroded iron and steel, this fact being taken advantage of in at least one commercial waterproofing material for concrete, which is composed of iron in finely divided form. This being mixed with the concrete expands as it rusts, thus filling the pores and reducing voids to a minimum. There is a practical limit to the expansion which may be allowed, but this is aside from the subject. The fact to be considered is whether the rusting of the encased steel beams may not largely increase the widths of the cracks and tend to further separation of the steel and concrete. This rust cannot decrease the space between the steel and concrete, for the concrete is set before rusting begins and the surfaces in contact are smooth, except where the concrete is sheared, and here the rust particles will lodge and by swelling exert an expansive force, first evident on the lower surface of the slab. Nothing can be done to protect the surface of the steel after corrosion begins without destroying the concrete envelope. The evil day may be postponed by first pickling the steel and then giving it one or two coats of whitewash and using a liberal amount of hydrated lime in the concrete. In defense of the preference shown by some designers for the encased I-beam slab the fear is expressed that vibration due to traffic may destroy the bond between the concrete and steel in reinforced slabs. The facts do not warrant such fear, and the continued use of the hybrid slab with steel beams encased in concrete is due to a conservatism that is opposed to economy and efficiency.

Tests made by Prof. H. C. Berry at the University of Pennsylvania in 1908 showed that reinforced concrete beams six weeks old tested for the effect of repeated loading were not affected materially by as many as one million repetitions of high working stresses. Duplicate beams were made and one set tested to failure in the ordinary manner while the others were subjected to repeated loading sufficient to cause higher stresses than are ordinarily allowed in good practice, after which they were tested to failure. Both sets of beams showed the same ultimate strength. These tests confirmed others made before by well known investigators, and prove that vibration does not affect the bond between concrete and the reinforcing steel embedded in it, provided the stresses do not run over one-half the elastic limit of the steel and over one-half the ultimate strength of the concrete. That is, reinforced concrete has a permanent elastic or fatigue limit about equal to 50 per cent. of its ordinary ultimate strength.

The use of reinforced concrete with conservative working stresses and due allowance for impact can safely be accepted as good practice in railway construction. Reinforced concrete slabs are not an experiment. The material has been used for about fifty years. The most suitable steel is that sold at the lowest pound price and in regular sections so placed in the concrete that the latter in setting grips it firmly. The adhesion is perfect and the compressive strength of the concrete is developed. This results in the use of less than half the steel required for I-beam slabs and requires little, if any, more concrete than that necessary to encase the steel beams.

THE BOND PROBLEM.

From time to time during the last three years we have had occasion to point out the scope and magnitude of bond transactions in railway finance. What may be called a bond period for the railways was not long ago in clear evidence, and the more so if the term "bond" is used to describe the short note. Outwardly the bond and the short note differ, the one being a mortgage security, the other an unsecured note of hand. The distinction holds sharply in the case of a weak railway corporation, but practically it fades away, as regards security, when the railway corporation is conservative, solvent and dividend paying. There is, in such a case, a difference in the interest rate, due to the investor's favor for the "long" security, but little or none in certitude of maturity payment. Using, then, the term "bond" broadly, the change of the last few months has been striking. The old bond period has diminished to low terms, particularly so in railway bonds of the first grade which have increased in their investment return a considerable fraction of one per cent.—that is to say, decreased proportionally in selling price. And municipal bonds of high grade have followed the same rule as compared with the immediately pre-panic time.

This change in the status of the railway bond is logical. In the reaction from the lower panic prices, when also the conservative investor sought the bed rock railway security, his disposition since to accept a little edge of risk for the sake of the higher return is elemental in human nature. But

far deeper than that as a fiscal force is the increased cost of living. This may not affect the investor of normal surplus income or the mere speculator or the man of reckless extravagance—the man who mortgages his home for an automobile—but it does affect the vast group of smaller investors with, at most, their few thousands a year derived from interest and dividends. The burden of high prices which they carry as "ultimate" consumers has driven them to a changed viewpoint. In the case of the railways, temptation, not to say positive urgency, for the sake of increased income leads them away from the senior to the junior security and the old 4 or even 3½ per cent. return asked for has risen to 4½ and 5. The demand for a similar increased return on railway stock investment falls in the same economic category. "Institutional" investment, though under the restraint of law, has measurably followed suit. So the railway corporations, for a period more or less indefinite, must, in their new financing, pay a higher rate to get their money.

The direction of such new financing, especially in bonds, is an interesting problem of the future. It will vary, of course, with separate corporate conditions. We have already seen the situation reflected lately in the case of half a dozen large railway companies which have put out new stock, usually at par to old stockholders. It has for them the joyous realisms of an immediate "melon," but for the corporation not always so jocund results when the melon ripens into a large increase in the dividend requirement. In the more important matter of bond financing, the railway short note may practically be ruled out as a device to meet a temporary exigency like that of the panic period—though it appeals to a certain class of investors who like what is next to cash in hand. In the case of old, long mortgage bonds maturing, the railways will probably follow precedent and refund with consolidated mortgage bonds at a somewhat increased interest rate. The real bond question for the railways to answer, however, will be the placing of new bonds for extensions or improvements, where they must respond to the average investor's demand for at least a fair security bearing a higher interest rate. Will it be a junior sub-mortgage bond or a debenture? Will it be a collateral bond based on outside securities held in trust? Or will it be the convertible bond, not necessarily bearing a high interest rate but appealing to some new investors with speculative hopes based on future convertible values, and appealing also to the confidence of old stockholders?

With half a dozen directions in which it may move, the main trend of future bond financing at the present juncture of bond depression is interesting. The unpleasant fact in the situation is that the higher rates for new railway funds comes at a time when other demands, like those of labor, are pressing hard on the managements. The cheering fact is that the investment conception of the railway bond as an ultimate *security* remains unimpaired. If to it can be added as coming facts the conceded right and the reality of increased railway rates, the bond problem will simplify itself and the higher bond rate for the investors be a relatively trifling item in railway budgets.

GENERAL ELECTRIC COMPANY.

In the 11 months ended December 31, 1909, the General Electric Company was able to save for net earnings 9.1 per cent. of gross sales, as compared with net earnings of 6.5 per cent. of gross sales in the fiscal year ending January 31, 1909. This was after charging off for depreciation of plants $2,447,984 in 1909 and $1,524,295 in the previous fiscal year. Gross sales in the 11 months of 1909 amounted to $51,656,632 and in full year 1908 to $44,540,676. After adding to this amount the profit from sales of stocks and bonds and subtracting from it depreciation, heretofore mentioned, and interest accrued on debentures, the company's report shows a profit for the 11 months of 1909 amounting to $6,493,671, and for the previous full 12 months' fiscal year of $4,802,253. From the profits of the 11 months the total dividends for the year, including those paid January 15, 1910, amounted to $5,214,352, were paid. In the previous year $5,214,026, including dividends paid in January, 1909, in the previous year, was paid. This left a surplus at the end of the 11 months of $1,279,319, as compared with a deficit at the end of the previous fiscal year of $411,773. It will be noted that a somewhat larger percentage was written off for factory plants last year than in previous years, due to the fact that a greater number than usual of the year's extensions thereto was for other than strictly productive purposes, as real estate, warehouses, etc.

The total sales billed in the 11 months were $51,656,631, as against $44,540,676 in the previous 12 months, and total orders received amounted to $54,360,562 in the 11 months, as against $42,186,917 in the previous 12 months. During the last fiscal year orders received during the first six months were at yearly rate of $49,769,000, and for the last five months were at yearly rate of $69,670,000. The year 1907 was the best from the point of view of orders received of any year in the history of the company, and during that year orders received totaled $60,483,659.

Unfilled orders as of December 31, 1909, were about $15,600,000, as compared with $13,000,000 at the close of the previous year. The total number of separate orders and contracts received was 9 per cent. greater in the 11 months under review than in the previous fiscal year, and the average value per order was 20 per cent. larger than in the previous year. A slightly greater proportion of orders called for payment on shipment in 1909 than in 1908, and 69.1 per cent. of orders specified 30 days in 1909, as compared with 68 per cent. calling for payment within 30 days in 1908.

The balance sheet shows cash on hand December 31, 1909, of $17,623,467, as compared with their cash on hand January 31, 1909, of $22,233,571. The company had accounts payable of $2,753,617 and dividends payable of $1,303,592, a total of $4,057,209. At the close of the previous fiscal year the company had accounts payable of $2,836,835. It will be noted that the company has changed the date of closing its fiscal year from January 31 to December 31, so as to comply with the requirements of the new corporation tax law. Therefore the dividends payable in January were not a current asset in 1908, because they had been paid before the balance sheet was drawn up, while they were a current asset in 1909, since the balance sheet was not drawn up before their payment. Subtracting these dividends due in January from the cash on hand December 31, 1909, the company had a working capital of well over $6,000,000, which would appear ample. Notes and accounts receivable amounted to $19,377,972 last year, as compared with $18,873,058 the year before. Merchandise inventories show assets of $25,150,036 at the end of 1909, as compared with $18,393,899 at the close of the previous fiscal year. In the inventory, active selling, finished and partly finished apparatus and supplies were valued at factory cost; inactive or slow selling apparatus and supplies at 50 per cent. of factory cost and obsolete apparatus and supplies at scrap value. In estimating the value of notes and accounts receivable, which were carried at a book value of $19,377,972 in 1909 and $18,873,058 the year before, a conservative reserve has been charged off from the face value of accounts and notes for depreciation. This reserve for depreciation charged off from the face value of notes to arrive at book value amounted to $1,840,000 in 1909 and $1,906,825 in 1908.

The fulness and frankness of the General Electric Company's annual reports and the conservatism with which inventories and valuations have been made has been commented on before in these columns. It is worth while, however to call attention again to this practice. In conservatism in making inventories and valuations the General Electric by no means stands alone, but in the fulness of information contained in its annual report it is an exception to most industrial companies, and we do not believe that this policy of frankness has given competitors information that has hurt the business.

Contributed Papers.

KEEPING RECORDS OF TEST TIES.

BY F. J. ANGIER,
Superintendent Timber Preservation, C., B. & Q.

In the *Railway Age Gazette* of March 17 I note the following comments in answer to questions propounded by the Tie Committee of the American Railway Engineering & Maintenance of Way Association:

"It is suggested that instead of dating nails, a certain number of test ties be put in, those of each kind and date being put at a certain mile post."

"Better results would be secured if statistics were kept on a few representative sections only."

"Section foremen's reports contain many errors; too much guess work is required, and the foreman does not keep the same position long enough."

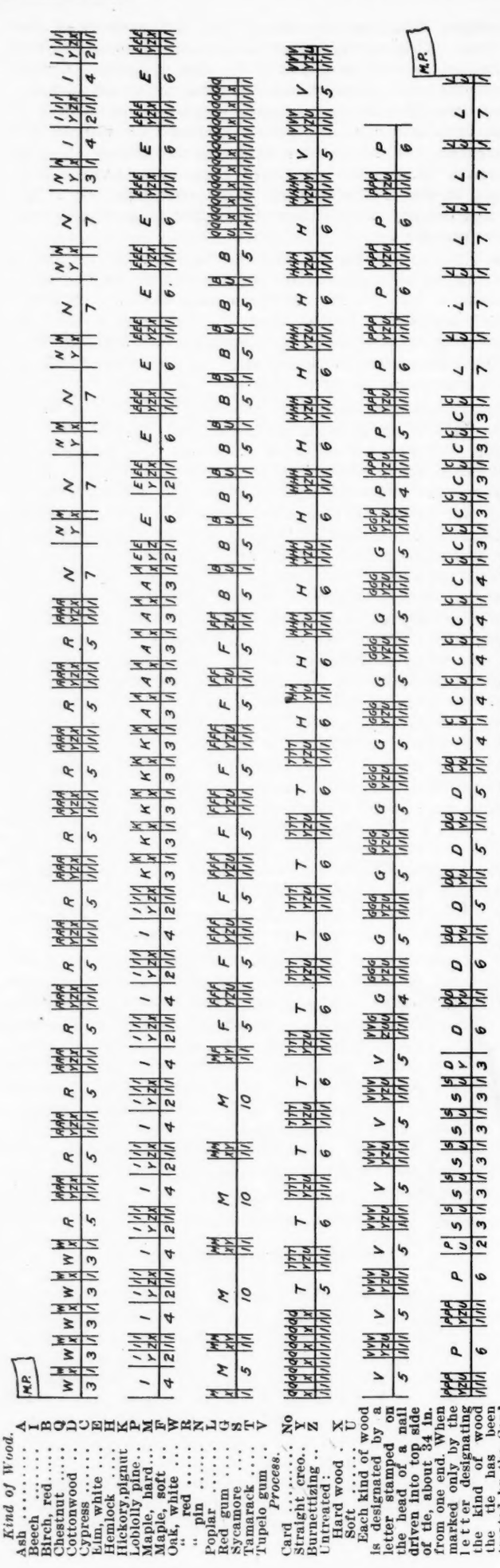
The Burlington has special test tracks on every division over its entire system, and has abandoned the dating nail, with the exception of these special tests. For ten years it was the practice on the Burlington, as it is now on many railways, to drive a dating nail in every treated tie. This nail was for the express purpose of enabling the management to keep a record of treated ties. Without the nail there would be no practical way of telling whether the tie was treated or untreated, or whether it had been treated one, two or more years before.

Treated ties are shipped to every section on the system. There are nearly 1,500 sections. Every section has a foreman in charge. To keep a record of the treated ties, every section foreman must report the number put in track and the number taken out of track. He must state in his report the year in which they were treated by examining the dating nail, and he must further state why they were removed from the track, whether because of decay, rail cut, burning or breakage. This record should be made each day that he puts in or takes out treated ties, and at the end of the month a full report of the month's work must be sent to the roadmaster for his approval, and then sent to the office where a permanent record is kept for the system.

Now for a correct and complete record we must depend on 1,500 section foremen to send in correct reports. We must assume that all of these men are competent to make these reports and understand just what is wanted, and that they are able correctly to decipher the figures on the heads of thousands of battered and rusty dating nails. No matter how many letters are written or how many sermons are preached, there will be thousands of ties placed in the track without dating nails in them, and thousands of *untreated* ties with dating nails which should not have been driven in them.

For argument's sake we will make the very broad assumption that there are some railways with a superior class of section foremen, and that the reports received at headquarters are absolutely correct. Under such circumstances what kind of a record do we have when every tie contains a dating nail? A tie is a tie, it matters not whether it is made of oak, pine, chestnut, maple, beech or any one of the twenty other species of wood. Your record then cannot show you which kind of wood is giving the longest life. There may possibly be some particular wood that is giving only one third or one-half the life of other treated wood, but how are you to know from the record? Your record shows that so many ties are taken out each year, some for decay, others for rail-cut, breakages, etc., but does your record say that gum ties are breaking in greater numbers than hickory, or that maple ties are being destroyed much more by rail cutting and spiking than beech or ash ties? These are the questions you want answered, and they never can be answered by the present method of putting a dating nail in every tie, and depending on the nail and the section foreman to give you a report.

After an experience of ten years with such a record, the



Note.—*Letters above the line indicate the kind of wood, and the process of treatment; the figures below indicate the number of ties.*

Burlington abandoned it and we now use the following method:

The Burlington system is divided into 19 divisions. On each division we have placed 1,000 special test ties, and other test ties will be put in from time to time as the management approves. A description of one of these test tracks will answer for all. One thousand ties were carefully treated and marked as shown in the the accompanying table:

Office Records, Experimental Ties.

Kind of wood.	Treated: Card process No. ties.	Mark.	Straight creosote No. ties.	Mark.	Burnettizing No. ties.	Mark.	Untreated No. ties.	Mark.	Total No. of ties.
Oak, white	15	W	..	....	..	....	5	W-X	20
" red	50	R	10	R-Y	10	R-Z	10	R-X	80
" pin	35	N	15	N-Y	..	....	5	N-X	55
Beech	40	I	20	I-Y	10	I-Z	10	I-X	80
Hickory, Pignut	15	K	..	....	..	....	5	K-X	20
Ash	15	A	..	....	..	....	5	A-X	20
Elm, white	42	E	10	E-Y	7	E-Z	8	E-X	67
Maple, hard	35	M	3	M-Y	..	....	5	M-X	43
Maple, soft	35	F	8	F-Y	7	F-Z	5	F-U	55
Birch, red	40	B	..	....	..	....	8	B-U	48
Chestnut	15	Q	..	....	..	....	15	Q-X	30
Tamarack	47	T	8	T-Y	8	T-Z	8	T-U	71
Hemlock	47	H	8	H-Y	7	H-Z	8	H-U	70
Tupelo gum	40	V	9	V-Y	7	V-Z	8	V-U	64
Red gum	39	G	8	G-Y	7	G-Z	9	G-U	63
Loblolly pine	45	P	7	P-Y	7	P-Z	10	P-U	69
Sycamore	15	S	..	....	..	....	5	S-U	20
Cottonwood	27	D	8	D-Y	..	....	5	D-U	40
Cypress	35	C	..	....	..	....	10	C-U	45
Poplar	35	L	..	....	..	....	5	L-U	40
Total	667		114		70		149		1,000

Explanation.—Each kind of wood is designated by a letter stamped on the head of a nail driven into the tie, on the top side about 34 ins. from one end.

Burnettizing process (or straight zinc chloride) is designated with the letter "Z" following the letter designating the kind of wood. For instance, "R-Z" means a red oak tie treated with zinc chloride only.

Straight creosote process is designated with the letter "Y" following the letter designating the kind of wood.

Card process (or a mixture of creosote and zinc chloride), has no letter, and a tie containing only the letter designating the kind of wood in addition to the dating nail "09" means that it has been treated with the card process.

Untreated ties are designated with the letters "X" and "U." "X" means that it is an untreated "hardwood" tie, and "U" an untreated "softwood" tie.

Notice that each kind of wood, as well as each kind of treatment, is designated with dating nails. A careful record is kept of every charge of ties treated and used in this test to show the details of the treatment as to seasoning, steaming, pressure, vacuum, etc., as well as the amount of preservatives injected. Whenever a tie is removed, it cannot be disposed of until permission is given from the timber treating department; its location in track is determined by the blue print record reproduced herewith.

There it will be noted that the ties are placed in one continuous stretch of track, and alternated with the different kinds of wood, and with the different methods of treatment and with untreated ties. This test need be made but once in ten years. The record will show not only the relative lives of treated and untreated ties but also the relative lives of the different kinds of wood and the different processes of treatment, not only from the standpoint of preservation, but also from a mechanical standpoint. It will show whether a cottonwood, a poplar or a pine tie will fail from rail or spike wear sooner than a birch, tamarack or hemlock, etc. Again, only 19 section foremen instead of 1,500 are required to look after these tests, and, being so few in number, a representative of the timber treating department inspects these test tracks each year, or oftener, as the case may require, and personally sees that these 19 foremen understand and are properly looking after these tests. The general manager, the general superintendent and the superintendent are all personally interested and have handed down explicit written instructions to all concerned. Suitable stakes with copper plates mark the beginning and ending of every test track.

Last, but not least, is the saving in dollars and cents effected by this method as compared with the method of dating every tie. To put a dating nail in every tie treated on the Burlington (about 2,300,000 per year) would cost in round numbers $8,000 a year for labor and material. In ten years this would amount to $80,000. To make the special tests, placing 5,000 ties on each division, once during ten years, would cost about $5,000. The saving in ten years would, therefore, be $75,000.

NOTE.—*Letters above the line indicate the kind of wood, and the process of treatment; the figures below, the year treated by the card process.*

UNIT COAL AND THE COMPOSITION OF COAL ASH.

The Engineering Experiment Station of the University of Illinois has just issued Bulletin 37, which contains the results of investigations made by S. W. Parr, Professor of Applied Chemistry, and W. F. Wheeler, first assistant, Department of Chemistry. These investigations were made to obtain the properties and a more definite determination of actual or unit coal.

By unit coal is meant the organic material which is involved in combustion, as apart from the mineral constituents which, in their natural state, enter into the composition of all coals. From the experiments described in the bulletin, it appears that when similar cases are compared, the variations in composition are chiefly in the extraneous matter; that for a given district, and more especially for a given mine, the value of the unit coal is practically constant. The heating value of the actual coal may vary considerably, but when the portion of the whole which is not coal is eliminated, the resulting material is of constant value.

Tables exhibit the thermal and chemical properties of coals, chiefly from Illinois, but also from other portions of the United States. Attention is called to the necessity of careful methods in determining the ash content. Certain districts, especially in Illinois, contain a peculiarity in the ash composition, heretofore overlooked, viz., the existence of calcium carbonate in sufficient quantity to make it advisable to modify the usual ash determination to account for this constituent, which may occasionally be met to the extent of 5 or 6 per cent. of the total weight of the coal.

The conclusions of these investigations are summed up on one page of the bulletin as follows:

1. The actual or unit coal of a given deposit or region is remarkably uniform in composition, as shown by the constancy of heat values, when calculated to such unit substance.

2. The true percentage content of the actual or unit coal hinges upon the correct determination of the inorganic constituents of the coal. The present methods of analysis fail to take account of such constituents as the hydration of the shaley or clayey portions of the ash or the carbon dioxide content of earthy carbonates. The presence of chlorine compounds may sometimes be sufficient in amount to require consideration and estimation.

3. Coal with an ash of unknown composition should be examined for carbonates and chlorides. If the combined amount of these constituents approximates 0.5 per cent., the ash determination should be made at a temperature sufficiently high for their complete elimination, and a correction made for the ash value thus obtained by adding the amount of CO_2 and Cl found.

4. Apart from the corrections which may be called for on account of the presence of CO_2 or Cl, a factor for hydration is necessary, amounting to 8 per cent. of the ash as determined, minus the ferric oxide resulting from the decomposition of the iron pyrites.

5. The assembling of the corrections indicated may be embodied in a simple formula, easy of application, and under two headings as follows:

For coals free from carbonates and chlorides

$$\text{Unit B.t.u.} = \frac{\text{Indicated Dry B.t.u.} - 5{,}000\ S}{1.00 - (1.08\ \text{Ash} + 22/40\ S.)}$$

For coals with carbonates and chlorides

$$\text{Unit B.t.u.} = \frac{\text{Indicated Dry B.t.u.} - 5{,}000\ S}{1.00 - [(\text{Ash at high temp.} + CO_2 + Cl)\ 1.08 + 22/40\ S.]}$$

Copies of this bulletin may be obtained gratis by addressing W. F. M. Goss, Director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

REST HOUSE FOR SECTION MEN.

The rest house for section men shown in the accompanying photograph, as well as a spring house of similar design, were built last fall just south of Eltonburg, Pa., on the Pennsylvania Railroad. The greater part of the work of constructing them was done by a foreman and rodman. The slabs for the work were given to the company by a lumberman near Eltonburg, and the posts were cut in the woods near the spring house. The foreman, C. V. Jaeger, and the rodman, Palmer, spent three full Sundays on the work, and a foreman of carpenters, Gorman, spent one Sunday. No charge was made for the time which these men put on the work. The watch box was originally a standard box, and was in need of repair.

Rest House for Section Men; Pennsylvania Railroad.

The supervisor, J. W. Keenan, decided to repair the building at the least possible expense by covering it with slabs, thus making it ornamental as well as useful. He made a working sketch for his foreman and sent the latter and a rodman to visit several bungalow sheds in the neighborhood. They worked the details out as the building progressed, and the photograph shows the results. It is intended that the bungalow shall be used as a watch box and as a place for trackmen to eat their lunch during severe weather. The shelter over the spring house was erected from material left over from the watch box. Its purpose, of course, is to keep leaves from falling into the spring, as this spring is an excellent one and strong in all seasons of the year. The total cost of the material in the two buildings was $7.85.

FOREIGN RAILWAY NOTES.

There has been published in the *Chinese Official Gazette* a description of a proposed railway to be built from Haichau, in the province of Kiangsu, to Chinese Turkestan. It is estimated that the road will cost about $10,500,000. It is proposed to develop the port of Haichau, which lies on the seacoast about half way between Chesio and Shanghai. The road will extend westward through the Yellow River valley.

Senator Knox, in his recent note to the powers proposing the neutralization of the Manchurian railways, announced that a syndicate of Americans and Englishmen had obtained from China a concession for the construction of a railway from Aigun, in Northern Manchuria, to Chin-Gow, and that the governments of the United States and Great Britain intended to support the enterprise diplomatically. This announcement brought from Russia an expression of disapproval of the undertaking, on the ground that the route proposed would be open to strategic objections in case of war. Russia also protested to China against the concession, alleging that China had agreed that only Russian capital should be employed in the building of railways north of Peking in case the railways were not financed by the Chinese themselves. China replied that the agreement cited had been abrogated by Russia's failure to protect China from Japan as promised. As far as known Russia has not withdrawn her objections.

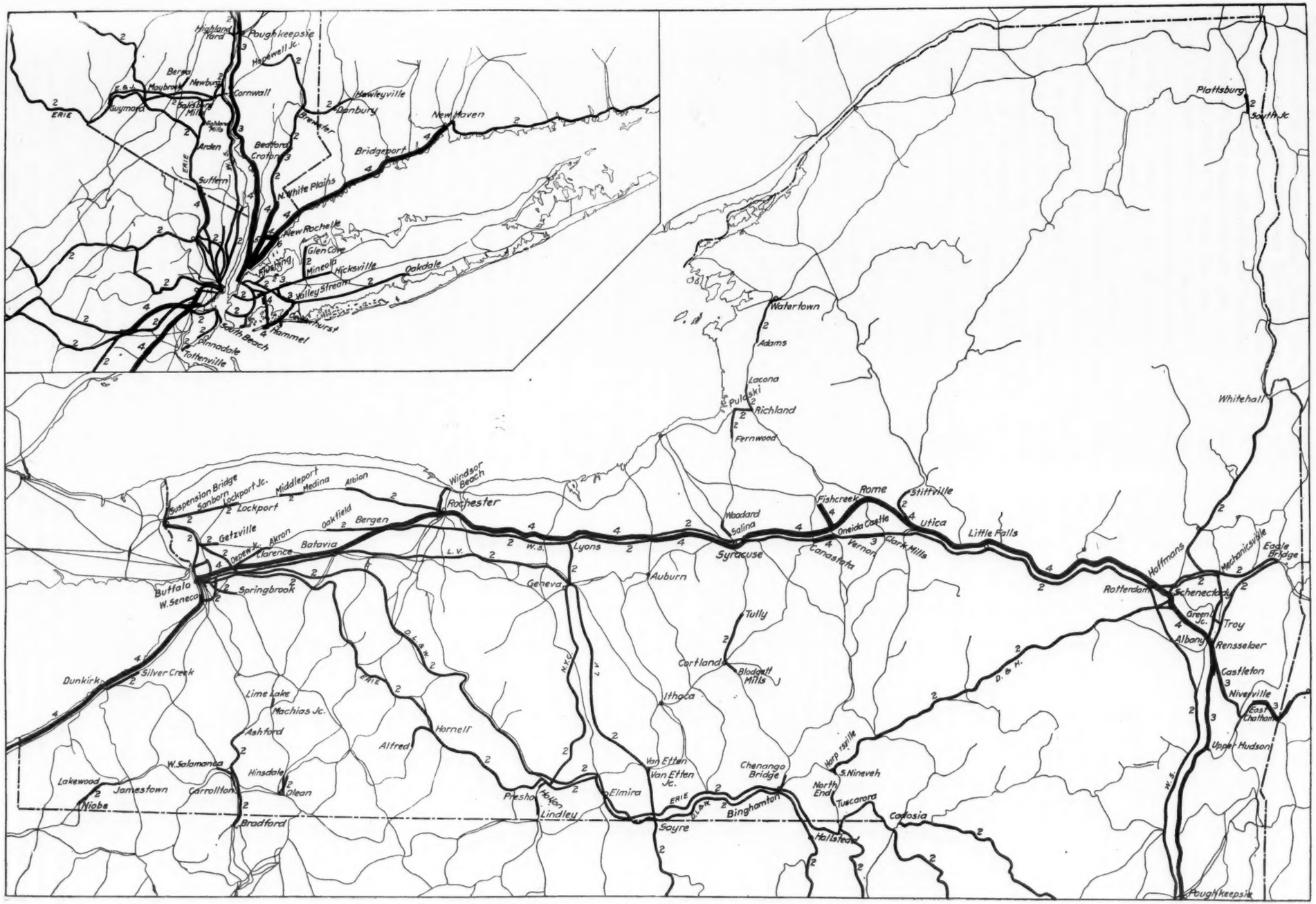
MULTIPLE TRACK RAILWAYS IN NEW YORK STATE.

Following the maps of double-track railways in the New England States, printed in previous issues, we give herewith a similar map of the state of New York, in which there are long stretches of three-track as well as four-track line, and one short piece of road with five tracks. In the list given below the approximate mileage is given for those sections of considerable length. On the New York Central, between Albany and New York, both on the east side and on the west side of the Hudson river, the changes from two-track to three-track occur so frequently and are so subject to further changes by additions of new track that we have not attempted to indicate the sections graphically. The principal termini of these sections are shown in the table. The Harlem division of this road, which is shown with two or more main tracks as far north as Brewster, is undergoing reconstruction at the present time. The four-tracking has been entirely completed only as far as Wakefield, 12 miles from the Grand Central Terminal. The southern end of the Putnam division of the Central is obliterated by the five-track line of the Hudson division, by reason of the necessarily small scale of the map. The Putnam division is double track from One Hundred and Fifty-fifth street, New York, northward to the junction with the Yonkers branch of that division, and thence over the branch to the terminus in Yonkers.

In and around Buffalo there are numerous sections of two-track line which could not be clearly shown on the map because of the small scale.

NEW YORK STATE.

	No. tracks.	Approx. miles.
Boston & Maine.		
Eagle Bridge to Troy	2	21
Eagle Bridge to Rotterdam Junction	2	42
Central New England.		
Poughkeepsie Jctn to w. end Highland Yd	2	3
Berea to Maybrook	2	3
Delaware, Lackawanna & Western.		
Buffalo to Hallstead, Pa.	2	217
Binghamton to Chenango Bridge	2	11
Blodgetts Mills to Tully	2	16
Delaware & Hudson.		
Plattsburg to South Junction	2	5
Whitehall to Albany	2	78
Green Island Junction to Troy	2	2
Mechanicsville to Harpursville	2	126
Nineveh to South Nineveh	2	1
North end to Tuscarora	2	3
Lake Shore & Michigan Southern.		
Buffalo to West Seneca	2	5
West Seneca to Dunkirk	4	34
At Dunkirk	2	2
Dunkirk to State line	4	25
Lehigh Valley.		
Buffalo to Sayre, Pa.	2	177
Van Etten Junction to Van Etten	2	1
Depew Junction to Tonawanda Junction	2	11
Tifft Farm to Harlem Avenue Junction	2	..
Buffalo, Rochester & Pittsburgh.		
Buffalo to Buffalo Creek	2	2
Ashford to Bradford, Pa.	2	29
New York Central & H. R.		
Buffalo to Albany	4	301
Albany to Rensselaer	2	1
Rensselaer to Castleton	4	8
Castleton to Croton	2	100
Fishkill Landing to Chelsea	3	3
Camelot to Poughkeepsie	3	5
Staatsburgh to Rhinecliff	3	5
Barrytown to Tivoli	3	4
Linlithgo to Greendale	3	2
Stockport to Newton Hook	3	3
Croton to New York City	4	34
155th street to Yonkers	2	8
New York to Wakefield	4	12
Wakefield to Brewster	4	39



Multiple Track Railways in the State of New York.

Southeastern part of state in upper left-hand part of page.

	No. tracks.	Approx. miles.
Troy to Rensselaer	2	7
Hoffman's to Rotterdam Junction	2	4
Buffalo to Suspension Bridge	2	24
Tonawanda to Getzville	2	5
Rochester Junction to Windsor Beach	2	10
Lyons to Hollon	2	75
Presho to Lindley	2	4
Mount Kisco to Bedford	3	3
Spuyten Duyvil to Yonkers	5	4
Suspension Bridge to Lockport	2	19
Middleport to Medina	2	4
Albion to Rochester	2	31
Richland to Pulaski	2	4
Woodard to Salina	2	5
South Schenectady to Carman	2	4
Utica to Stittville	2	10
Watertown to Adams	2	14
Lacona to Richland	2	6
Pulasko to Fernwood	2	4
West Shore (N. Y. C. & H. R.)		
Tappan to West Nyack	2	4
West Nyack to Haverstraw	3	8
Haverstraw to Stony Point	2	3
Stony Point to Tompkins Cove	3	2
Tompkins Cove to Jones' Point	2	2
Jones' Point to Iona Island	3	2
Iona Island to Fort Montgomery	2	2
Fort Montgomery to Highland Falls.	3	4
Highland Falls to Esopus	2	34
Esopus to Ulster Park	3	2
Ulster Park to Lake Katrine	2	10
Lake Katrine to Mount Marion	3	3
Mount Marion to Saugerties	2	3
Saugerties to West Camp	3	4
West Camp to Catskill	2	7
Catskill to West Athens	3	5
West Athens to Clark's Mills	2	124
Clark's Mills to Vernon.	3	9
Vernon to Oneida Castle	2	5
Oneida Castle to Canastota	4	6
Canastota to Oakfield	2	137
Akron to Depew Junction	2	11
Boston & Albany.		
Rensselaer to Niverville	3	15
Niverville to East Chatham	2	14
East Chatham to State line	3	9
Hudson to Upper Hudson	2	1
New York, Chicago & St. Louis		
Silver Creek to Dunkirk	2	9
New York, New Haven & Hartford.		
Woodlawn to Cannecticut line	4	14
Harlem River to New Rochelle	6	12
Hopewell Junction to Danbury, Conn.	2	34
New York, Ontario & Western.		
Cadosia to Cornwall	2	108
Pennsylvania.		
Buffalo to Springbrook	2	11
Lime Lake to Machias Junction	2	2
Hinsdale to Olean	2	7
Staten Island R. T. Co.		
Cranford Junction, N. J., to South Beach	2	12
Clifton to Annadale	2	8
Pleasant Plains to Tottenville	2	2
Erie.		
Suffern to Buffalo	2	393
Newburgh to Salisbury Mills.	2	9
Hornell to Alfred	2	9
Hinsdale to Olean	2	5
Carrolton Junction to W. Salamanca	2	8
Waterboro to Lakewood	2	14
East Buffalo to International Junction	2	4
International Junction to Int. Bridge	2	..
N. J. state line to Sparkill	2	2
Highland Mills to Guymard Junct'n, N.Y.	2	42
Arden Junction to Vail Gate, N. Y.	2	..
Lakewood to Niobe, N. Y.	2	9
Bergen to Fish Creek, N. J.	4	..
Long Island.		
Long Island City to Holban	2	..
Holban to Floral Park	3	..
Floral Park to Hicksville	2	10
Long Island City to Springfield	2	13
Springfield to Valley Stream	3	3
Valley Stream to Oakdale	2	31
Woodside Junction to Flushing	2	5
At Bayside	2	..
Mineola to Glen Cove	2	9
Hammell to Cedarhurst	3	3
Cedarhurst to Valley Stream	2	3
Flatbush Avenue to Railroad Avenue	2	4
Railroad Avenue to Woodhaven Junction	4	3
Woodhaven Junction to Jamaica	2	2
Fresh Pond Junction to Manhattan Beach	2	..
Bay Ridge to Manhattan Beach Junction	2	..
Glendale Junction to Ozone Park	2	..
Ozone Park to Ramblersville	4	..
Ramblersville to Sea Side	2	..
Sea Side to Rockaway Park	4	..

[1] Except as noted in next six lines.

SIDE TRACK AGREEMENTS.

BY LUIS JACKSON,
Industrial Commissioner, Erie Railroad.

Side track agreements are frequently the cause of some friction when first presented to shippers who are negotiating with the railway for a side track connection. The clauses of the railway company's agreement seem arbitrary to the shipper. Having had about twenty years' experience in arranging for side track connections with manufacturing plants, I give my views on the clauses of the agreement.

They were doubtless well thought out by the railway officials of an earlier date, but the reasons for the creation of these clauses have been lost sight of by many of the present day officials, as I frequently find that they inadequately explain to the shipper the reasons for the clauses. Furthermore, the shipper sometimes consults his lawyer, who makes a protest, but when the matter is fully explained the protest is withdrawn. This has been my experience in numbers of cases. There is railway law, admiralty law, insurance law, etc., all with their various intricacies, and a general lawyer, like a general medical practitioner, thinks he understands all cases. When the agreement is referred to a lawyer or a layman, who has not given previous thought to, or had experience with, the subject, his first view is that the agreement is somewhat one-sided. Similarly in proposed new railway laws the statement, "All rates shall be equal," immediately appeals to the general public as highly just, whereas it is most unjust until the clause is amended to read, "All rates shall be equal under similar circumstances and conditions."

The first principle in relation to a side track agreement is that the railway is not a common carrier when it is operating on a private side track. When it leaves its own rails to go on a private side track it is giving a service not covered by the regular freight rate. If the rate from one station to another be 25 cents per 100 lbs., the road gets that rate whether the shipper loads the freight in cars on a private side track or takes it to the station. The argument that when the shipper has a private side track the railway benefits in receiving the goods in carload lots without handling will not apply, because the benefit is not only to the railway but to the shipper as well. When the shipper carts his goods to the station it costs him, for team hire, an average of $1 a ton, and it costs the railway about 25 cents per ton for platform handling. Therefore, the side track saves the shipper and the railway, between them, an average of $1.25 per ton. The manufacturer who has no side track is at a disadvantage compared with the manufacturer who has, the difference being an average of $1 per ton, or 5 cents per 100 lbs., for cartage. In the eastern states and in large cities many manufacturing plants have grown from small beginnings. When they were first started a side track was never considered, and even after they expanded it was thought that as the goods manufactured were light a side track was not essential, so many plants have no side track facilities, while their competitors have.

The clause in the track agreement on height and width for clearance is generally acceded to, but the fire and personal injury clauses are the ones which raise most objection. The railway company's side track agreement stipulates that the road shall be held harmless by the shipper from fire or personal injury while operating on the track of the shipper, whether through the railway's negligence or not (wilful negligence excluded). Notwithstanding all the precautions that may be taken there is a risk of fire at the factory from locomotive sparks. Furthermore, the railway company has no police powers on private ground, and the shipper's employees may carelessly leave around cotton waste or other inflammable material which the locomotive might set on fire. An employee of the shipper may recklessly cross or lie down on the tracks, or do something which a trained railway employee will not do. The railway stipulates that it must be held harmless from personal injury risks. In operating on a private side track it takes care of its own men and its own equipment, and the shipper must take care of his. The railway's freight rate is from the nearby station. In going on the shipper's ground it is giving an extra service. It cannot, besides this, be expected to insure him. If the shipper operates on his side track with his own locomotive it is clear to him that he is taking some additional risk, and he says to his

insurance company, "I am operating an engine on my grounds and this must be covered in the fire insurance policy." Fires are mostly accidental or caused through negligence, and the insurance company covers him, whether or not the fire be caused through the negligence of his engineer. The same principle applies to employer's liability policies. The shipper must invariably protect himself by having a clause in his policies stating that he has his own railway on the ground, or that he has on the ground a side track operated by a railway company. The shipper must see to it that he is insured. Some insurance companies charge a slight additional premium on the policy when there is a track on the ground. Such a charge, however, is usually insignificant, and in most cases there is no extra charge. Even if the shipper operates on his track with his own locomotive it is essential that he sign the side track agreement, as experience proves that the one or two locomotives of a shipper are crippled at times and the railway has to be called on to help out.

If a railway received $50,000 gross freight a year from a manufacturing plant costing $1,000,000, and its locomotive set fire to and entirely destroyed the plant, the loss falls on the owner of the plant. If the railways were held responsible it would take about a hundred years of $50,000 gross freight a year to pay for $1,000,000 net loss. If the railway did not exempt itself from these fire and personal injury risks, it would have to take out regular insurance policies on every manufacturing plant with which it had a side track connection, thereby duplicating the insurance already taken out by the manufacturer. As the big lines each have several thousand manufacturing plants with side tracks, this extra insurance outlay on the part of the railways would amount to millions and necessitate a raise in freight rates to cover the item. The shipper who had no side track would have to pay this extra freight rate for the benefit of his competitor, who not only had the advantage of a side track but was getting insured besides.

When railway officials present side track application forms or agreements they should explain some of the clauses a little to the shipper. It is impossible to write a track agreement in legal form so that it will be smooth and pleasing to the shipper. It must and does state in unmistakable language exactly what is meant.

FAIR RETURN ON THE VALUE OF PROPERTY A FALLACIOUS STANDARD.*

The changing of rates under the power vested in the Interstate Commerce Commission is a continuing process. It is a process that goes on day by day, and every rate that is changed tends to call for a change in some other rate. The more precedents the commission establishes in that direction the more it is going to be bound and influenced by those precedents in the future. A notion which has a great deal of support in magazine articles and considerable support among prominent members of Congress and others in public life is that railway rates ought to be so reduced from time to time as that no more than a fair return shall be earned upon the property of the railway company as a whole. It is assumed by these gentlemen that the Supreme Court of the United States has established that doctrine. That is entirely incorrect. The Supreme Court has never decided any such standard for making rates and has never even considered the question. All the Supreme Court has ever decided upon this subject is that *one* rule by which to determine whether rates fixed by legislative authority are so low as to deprive a railway company of its property without due process of law, is that if under those rates the company would earn less than a fair return upon the fair value of its property, then those rates are unconstitutional because too low. That is as far as the Supreme Court has gone. It has dealt solely with the question as to whether these rates were so low as to be unconstitutional. It will be entirely consistent for the Supreme Court to hold in a proper case and upon a proper showing that regardless of the question of a fair return it is unconstitutional to deprive a railway company of the right to charge a rate that is reasonable for a specific service. When the Supreme Court comes to consider the legality of rates fixed by the Interstate Commerce Commission under the Interstate Commerce Act the court will have the right to pass upon a new question, which it has never had occasion to pass upon with respect to the rates which have been before it in the past. All those rates in the past have been rates fixed by state authority, and when the Supreme Court is considering rates fixed by state authority the court, generally speaking, cannot consider at all anything but the question whether those rates violate the Constitution of the United States. The court does not ordinarily consider whether the rates fixed by a state commission conform to the statutes of the state. That is not a federal question. But when it comes to considering the question whether rates of the Interstate Commerce Commission are lawful, then the question whether those rates conform to the Interstate Commerce Act is just as much a federal question as the question whether they conform to the Constitution of the United States. . . . The court, regardless of the question of fair return, will have the right to decide upon the fair value of the service—to decide upon the reasonableness of the rate as a fair compensation for a specific service performed.

And the commission when it deals with the rates of the railway company has absolutely no warrant for any assumption that it has the right to correct rates upon the theory that it may reduce them simply because upon the business as a whole the returns are more than what the commission regards as a fair return upon what it regards as the fair value. The commission's duty is to consider whether specific rates are just and reasonable, and if unreasonable to fix others which are just and reasonable. It is its duty to consider from a commercial standpoint the fair value of the service rendered and the question of reasonableness of the rate for that specific service.

It is essentially unjust to declare that a railway company has no right to earn more than a fair return, fixed by public authority, upon the fair value of the railway as fixed by public authority. When that assertion is made sight is entirely lost of the proposition that that leaves a railway company to take care absolutely of all the risks of years of depression when it is impossible for it to earn a fair return. Therefore averaging the bad years when it is impossible for it to earn an adequate return wth the good years when it is not allowed to earn more than a fair return, it follows as a mathematical certainty that the general average of railway earnings of this country upon that theory never could equal a fair return.

The division of regulation in this country into state regulation and federal regulation introduces still another element of injustice. If the fair return theory is correct, then it follows that the railways must not earn more than a fair return on their state business in any state and must not earn more than a fair return on their interstate business The question of reurn is thus split up among numerous subdivisions of the traffic A company which cannot make as much as a fair return with respect to any of these subdivisions of its traffic would not be permitted to recoup itself out of any other subdivision of the traffic, because it would be separately accountable to the federal government and to each state government and would be held down to the so-called fair return by each. In other words, our theory of railway regulation in this country multiplies the possibilities and probabilities of forcing the average return of the railways to a point far below a fair return on the property as a whole if each jurisdiction acting separately is to keep the railway within the fair return as a maximum for the business subject to that jurisdiction.

Another striking peculiarity about this standard, from

*From an address before the Traffic Club of Pittsburgh, March 18, by Walker D. Hines, acting Chairman of the Executive Committee of the Atchison, Topeka & Santa Fe.

which its advocates can never escape, is that they make the rates dependent upon the value, while at the same time the value is necessarily dependent to a substantial extent upon the rates. The more they cut down the rates the more they reduce the value, and the more the value is reduced the more the rates can be reduced in the future. So that the rule would work in a circle, always favoring reductions in railway rates.

Any such rule, as applied to railway rates, is utterly impracticable. This fair return theory necessarily attaches itself to the fair value of each separate railway. But each railway has its own value, influenced by its own conditions, which are perhaps very different from the conditions of other railways. Railway rates, however, can not be made a separate proposition for separate railways because the rates are established by competition between the railways. The theory overlooks the fact that rates can not be peculiar to each separate railway, but must be adjusted with a view to competition between all the railways. So the impracticability from that standpoint is manifest.

Take an aggregate return upon all the traffic of a railway company and it is beyond the bounds of human power to apportion that return upon any basis of cost of service or cost plus profit among the many thousands of articles which are transported, so that rule breaks down absolutely when you come to apply it to specific instances, and the only way to make rates is to make them for specific traffic. This rule is asserted as a rule for controlling rates, and yet it is a rule which cannot possibly be applied to any one specific case.

Assume that some tribunal should say that, as a whole, a railway company was making $1,000,000 too much and should set about reducing the rates so as to reduce the total return to that extent. You would have several thousand different rates, and the effort to cut down each rate so as to get rid of that supposed unlawful revenue would be a thing that could not be accomplished. A horizontal reduction on those rates would be the mathematical way to do it, and yet that would not accomplish it. It might stimulate traffic in some directions and reestablish the same supposed unlawful returns that existed before. And again a horizontal reduction would make such an insignificant change in all rates as to have no practical bearing upon commercial conditions, and yet as to have a very serious bearing on the railway revenues as a whole.

When these theorists assume that the railway must not have more than what they call a fair return upon the fair value of its property, they necessarily assume that the railway investment is a complete thing like an investment in so many bonds. But no railway investment is ever complete. The railway is a growing proposition all the time. It is bound to grow to meet the necessities of increasing traffic, and, more than that, it is bound to expend more money in improvements and in betterments and in extensions in order to adapt itself to the changing conditions of society. The nice, comfortable theory of the magazine writers entirely loses sight of that actual necessity of the situation. Where does that money come from that the railways have to add to and to put into their properties year after year? . . . A prominent railway company in the last three years, all the time paying regular dividends on its common stock, paid out $16,000,000 in dividends on its common stock, but applied over $20,000,000 out of its so-called net earnings to improvements of the property. Such expenditures inure immediately to the benefit of the public in improved service, but not to the benefit of the stockholders at all except as in the future they may be reflected in increased earnings.

I do not mean to imply that railway rates in the aggregate exceed what can properly be regarded as a fair return upon the present fair value of the property. On the contrary, the investments in railways are so enormous and the cost of operating railways so stupendous and railway rates are relatively so low that returns from railways are strikingly inadequate as compared with returns in other lines of business. . . . The true policy in this matter is that inasmuch as the railways in this country are built by private capital and must be operated at the risk of private capital, they ought to be allowed to make their rates, so long as those rates are not so high as to be unreasonable and oppressive. That is a negative rule which can be applied and enforced in view of commercial considerations. You do not have to compute these elaborate calculations in order to determine whether or not a given industry or shipper is oppressed by railway extortion. That is a thing which can be determined by the application of common sense to the surrounding commercial conditions. It has been in the past and can be in the future.

REFORMED PASSENGER TARIFFS IN ITALY.

BY PH. TAJANIE.

Engineer of the State Railways and Associate Professor at the Royal Polytechnic of Milan.

Italy is indebted to state management for a complete reform of passenger tariffs; and the new tariffs, based on a study of those previously adopted in other countries, have proved successful.

The tariff which was in force on the Italian railways in 1905, when the state began the operation of the lines, was among the highest in Europe, and the rates increased in proportion to the length of the journey so that they were really prohibitive for very long ones. Return trip and other common reduced rate forms were in use, but their field of application was very limited and there was very little travel. The rates in different countries on the Continent compared as follows:

TABLE A.—*Comparison of the Prices of Trips in the Different Countries of Continental Europe.*

(Prices are in centimes per kilometer.)

	Class 1.	Class 2.	Class 3.
Italy:			
For express trains	12.76	8.93	5.80
For local trains	11.60	8.12	5.80
France:			
For express and local trains	11.20	7.56	4.93
Switzerland:			
For express and local trains	10.40	7.30	5.20
Austria:			
For express and local trains.	7.95	4.77	2.65
Germany:			
For express and local trains	8.75	5.62	3.75*

*Tax not included.

The number of trips in relation to the population was much smaller in Italy than in other countries, in spite of the fact that in certain seasons the country is over-run with tourists. The following figures taken from the statistics of 1900 are cited to show the relation between the number of travelers and the population of different countries of Europe:

	Rides for 100 inhabitants.		Rides for 100 inhabitants.
England	2,282	France	796
Switzerland	1,259	Austria	355
Belgium	1,426	Italy	171
Germany	978		

Not only is the travel small, but long-distance travel is still less. Out of 100 travelers on our railways in 1903

70.46 went a distance of .....25 kilometers.
27.69 " " " " ..... 25 to 300 Km.
1.70 " " " " .....300 to 600 Km.
and only
0.15 " " " " .....600 kilometers.

It is true that the long journeys are often divided into stopping places, but there is no doubt that our tariff was out of proportion to the incomes of the great majority of the inhabitants. Besides this, it should be considered that the elongated form of our peninsula is accountable for the great distance between the northern and southern parts, which for economic and social reasons should be brought into closer relationship. Whatever have been the efforts which have been made since the time of the political unification between the northern provinces, with their numerous industries, and the southern provinces, which are exclusively given over to agriculture, there has always existed a disparity in their economic condition, which the government has tried to eliminate to the interest of all. One of the best ways of attaining such an end is that of encouraging the transportation of produce from

end to end of the peninsula, as well as the multiplication of personal relations between the inhabitants of the North and those of the South.

The short-distance traffic was not considered of much importance on its own account. Efforts have been repeatedly made to increase it, but they have amounted to nothing. The increase of the number of trains, stopping local trains between stations to accommodate the small, out-of-the-way towns unprovided with stations, allowing peasants going to the markets to transport their products as baggage, was not sufficient to develop the traffic of the towns and suburbs. Rural car lines, which in Italy are widely diffused, are able to make the cost of travel very small, not only on account of reduced cost of improvements, but also because they are exempt from the tax of 16 per cent. which is paid on railway tickets.

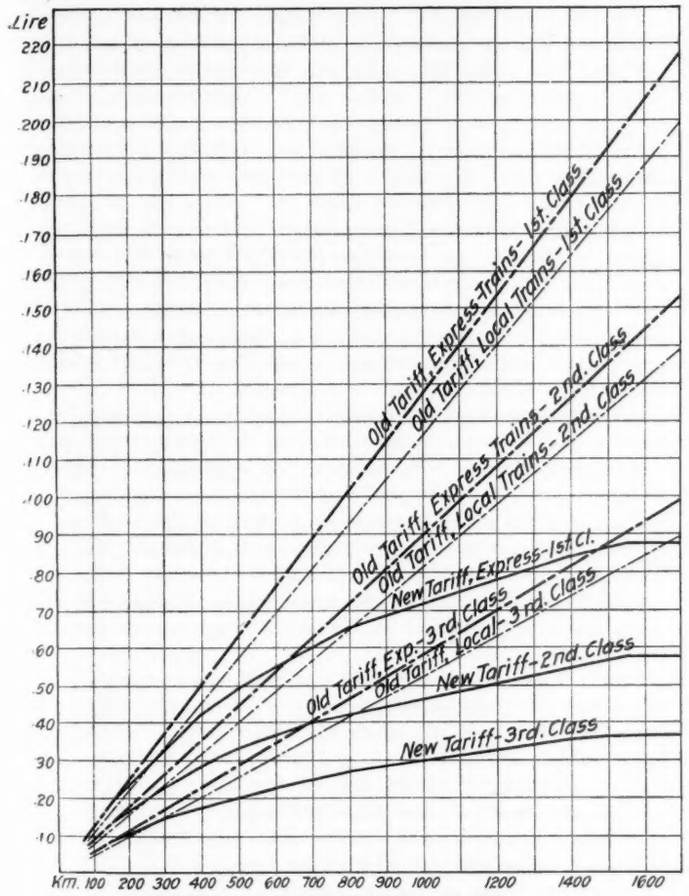


Fig. 1—Long Distance Tariff.

On the other hand, appreciable results have been obtained by the adoption of an "economical management" system, consisting of the application—following the example of the great French lines—of appropriate methods on the subsidiary lines forming part of the main system. The idea was to reduce the expenses and increase the number of trains. The expense of management was not successfully reduced, but the tariff was reduced and there followed such an increase in traffic that the reform became very profitable on many of the lines. The reduction had no very marked effects, however, on the longer lines. Extraordinary results were obtained when, with the reduction of the tariff, electric traction was adopted with increased frequency of trains.

On the line between Milan and Varese, equipped with the third-rail electric system, which runs through a zone rich in industries and terminates at Milan, a mixed electric and steam traction service was introduced and trains were run consisting of a greater number of cars than could possibly be drawn by steam locomotives.

Various experiments made led us to think that a new tariff reform would have to be made for all the lines, but in a rather limited radius, for, as we have seen, a reduction has scarcely any effect in stimulating travel beyond a certain limit.

Little by little, the problem relative to the reform of passenger tariff was taken up, and finally the arrangements for long distance and short distance journeys were considered separately.

One of the noticeable faults in our method was the inadequate service of the local trains in comparison with the express trains. A remedy was tried in changing over a number of local trains into express trains (which was also made necessary on account of the increased traffic) but besides this, it was deemed imperative to make such a decided difference in the tariff, as to induce many people to prefer local trains as a matter of expense.

For local trains, first-class passage remained almost entirely unused, and it was thought best to abolish it, but for reasons of policy the second class was ostensibly abolished, while keeping the first and the third. But in truth, whatever were the inside fittings of the coaches, the price of this new first class corresponded to that of the original second class.

For long distances a changeable tariff, based on the Belgian plan, has been in force since November 1, 1905; this is shown by the curves in Fig. 1. For the first 150 km. the prices remain the same; above this distance they decrease, and at about 250 km. the new express rates become less than the old for local trains. From 270 km. on, the prices vary by increments

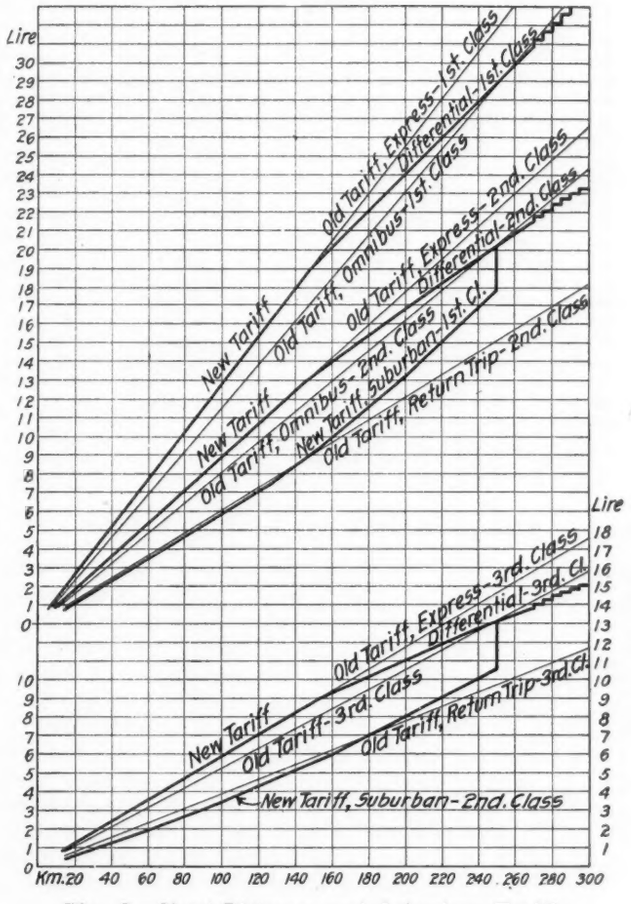


Fig. 2—Short-Distance and Suburban Tariff.

of 5 km. to a distance of 650 km. and from there on by increments of 10 km. From 1,550 km. the tariff remains constant; that is to say, it does not cost anything more, although the distance may become greater. A long trip in Italy costs only 87.50 lire for first class, 57.80 lire for second class, and 36.80 lire for third class. Thus for 1,550 km. (963 miles), or for any greater distance, the first class fare is only $16.89 (1 lira = 19.3 cents), or 1¾ cents a mile. The third class fare, 36.8 lire, amounts to only 7.3 mills per mile.

The importance of the reductions made is shown in Table B, containing examples of trips chosen at random from among those most frequently made between the more important towns, and from those which must be made in going from the extreme interior of the peninsula to the frontier stations. Counting 1 lira as 10 pence or 20 cents, the new rates in English and American money, per mile, are as shown in the lower part of the table, lines *a*, *b*, *c*, *d*, *e*, *f*, corresponding to the items in the upper part which are indicated by the same letters.

Table B.—*Typical Fares in Italy (In lire).*

Journeys.	Distances Kilometrs.	Distances Miles.	Old price Class 1.	Old price Class 2.	Old price Class 3	Present price Class 1.	Present price Class 2.	Present price Class 3.
A Turin-Rome ...	658	409	84.0	58.80	38.20	59.40	38.60	24.75
B Naples-Venice .	800	497	102.10	71.50	46.40	64.75	42.55	27.30
C Milan-Naples ..	884	549	112.80	78.0	51.30	67.80	44.70	28.55
D Modane-Brindisi	1,190	739	150.85	106.30	69.05	76.50	50.60	32.30
E Palermo-Iselle .	1,703	1,058	217.35	152.15	98.80	87.50	57.80	36.80
F Girgenti-Modane	1,788	1,111	221.80	155.25	100.85			
a Pence per mile						1.45	0.95	0.60
Cents per mile						2.90	1.90	1.21
b Pence per mile.						1.30	0.86	0.55
Cents per mile						2.60	1.72	1.10
c Pence per mile						1.23	0.81	0.52
Cents per mile						2.47	1.63	1.04
d Pence per mile						1.03	0.68	0.44
Cents per mile						2.07	1.37	0.87

e and *f* (see second paragraph above).

Naturally, such a tariff should not be available for a stop over and it was decided that between the two terminals of a trip the traveler should be allowed to go by but one way, the shortest.

This rule, which is perfectly logical, admits, however, of

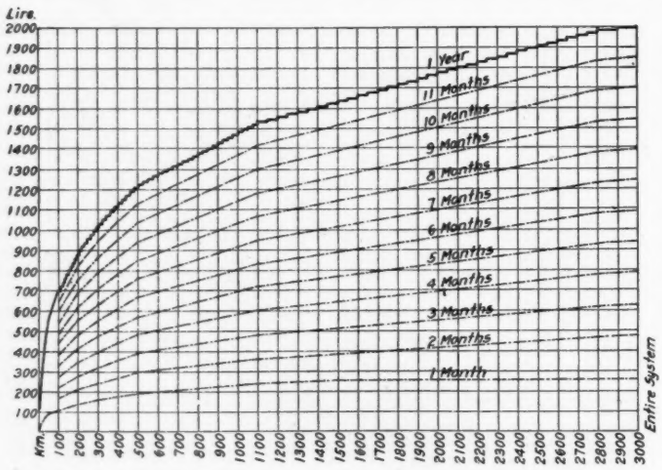


Fig. 3—Season Ticket Tariff, First Class.

two kinds of exceptions under the form of "choice of route" and "change of route." That is to say, in one case the traveler has the right to choose between two or more routes which run between the two extreme points of his journey, although the price is calculated upon going the most direct; in the other case a change from the route most direct to a longer one is permitted, in spite of the price, basing on actual distance.

It is known that similar tariffs exist in many other countries. Austria, Russia, Denmark and even Hungary have tariffs which are a good deal alike as we shall see. But practical difficulties were encountered in Italy, particularly with the great variety of ticket forms. Each station, however, was furnished with an information-board on which was indicated the shortest route between the station in question and each of the other stations on the line, and a schedule in which were listed the prices to the successive distances. It takes but two minutes to issue a ticket by consulting the board and the schedule. It is true that two minutes is too much time, but for the very frequent trips the tickets are already printed; and in spite of the reduction of the tariff, the long distance journeys will always constitute a small percentage of the total.

The differential tariff is not proof against abuse or illegitimate use of tickets. A continuous trip of 1,000 km. may be used for 500 km. by one traveler and for the remaining 500 km. by another. Such a mis-use of tickets cannot be carried out without a prearranged plan between those interested and the risk of losing a portion of the ticket price would certainly prevent a majority of travelers from trying to commit a fraud. Besides, this is treated as a misdemeanor to be severely punished; this has the effect of being a check, although it is very difficult, not to say impossible, to catch the culprits.

In spite of the existence of such a danger of fraud, it was decided to be liberal in the matter of the validity of the ticket and a day's run is fixed at 100 km.; that distance accomplished, a new 100 km. is commenced. Such a period terminates the day after the ticket is issued, and the validity of the ticket ends at midnight of the second day. The traveler is allowed to make one stop-over in 300 km.; two up to 600 km.; three up to 900 km.; four up to 1,000 km., and five stop-overs if longer than that. The length of the stops must altogether not exceed the time limit of the ticket.

In the first year of the application of the tariff there were favorable results. An excessive growth of long trips was not expected. The receipts the first year were one-half million lire, calculated net from the percentage increase which has been verified from year to year, as a phenomenon independent of the variations of the tariffs and resulting from the development of the traffic.

For the short distance travel it was thought necessary to make a very low tariff and covering, as before stated, only two classes, first and third, and not applicable to express trains.

The tariff for short distances was made on the principle of *increasing* the rate with the increase of distance. The diagram no longer takes the form of a convex curve, but a concave form, and the sum of the prices of two trips is *less* than the price of a trip equal in distance to the sum of the first two.

Figure 2 shows the old tariff and the two new tariffs; the rates for the longer distances serving for express trains and those for the short distances (suburban tariff) serving for local trains.

This second tariff has its field of application limited to 250 km., for the result of experience has shown that for more than this distance express trains, rather than local trains, are used, and will be provided with third class coaches.

In conclusion, up to 250 km., there will be a choice of traveling by express or by local, the former being in two classes, and the latter in three classes; but the travel in local trains will cost much less than in express, and this in a measure will result in freeing the express trains for the extraordinary mass of travelers found in the localities near large cities.

As can be seen from the diagram, the new tariff for the first class is less than the old second class.

In order that the reader may have a complete idea of the new tariff, we reproduce below a table in which are indicated all the prices from 10 to 250 km., and the different rates per kilometer, which increase instead of diminish, as in the case of the long distance tariff. The tax is included in the price.

Table C.—*Local Rates.*

Distance		Class 1. Fare, lire	Class 1. Centimes per kilomtr.	Class 1. Cents per mile.*	Class 2. Fare, lire.	Class 2. Centimes per kilomtr.	Class 2. Cents per mile.*
Kilometers†	10.	0.50	5.0	1.61	0.25	2.5	0.80
	20.	1.05	5.5	1.77	0.55	3.0	0.97
	30.	1.65			0.85		
	40.	2.25			1.20		
	50.	2.85			1.55		
	60.	3.45	6.0	1.93	1.90	3.5	1.13
	70.	4.05			2.25		
	80.	4.65			2.60		
	90.	5.25			3.00		
	100.	5.85			3.40		
	110.	6.50			3.80	4.0	1.29
	120.	7.15			4.20		
	130.	7.80	6.5	2.09	4.60		
	140.	8.45			5.05	4.5	1.45
	150.	9.10			5.50		
	200.	13.35	8.5	2.74	8.00	5.0	1.61
	250.	17.85	9.0	2.90	10.50		

*To get the rate in pence per mile, divide by 2.

†10 kilometers equal 6.21 miles; 50 equals 37.07; 100 equals 62.14; 150 equals 93.21, and 250 equals 155.35.

Shop Section

There are indications that some foremen regard their own kinks and economical methods as a trade secret, of more value if kept to themselves than if published. The contrary is true. We have received letters from the general officers of 92 railway companies urging and encouraging us in this undertaking to educate foremen, and saying in various ways that they will recognize any of their men who make good suggestions in our shop edition. Five of them say that they will duplicate any prizes won by their men in our shop kink competitions. A much larger number ask us to especially call their attention to foremen who send us good suggestions. The foreman who thinks and devises ways of saving time has now a fine chance to improve his condition. The prize money is the smallest element in it.

We have been surprised and delighted at the results of the competition which closed on April 15. Eleven of the manuscripts on "How the Foreman Can Promote Shop Efficiency" are so good that we shall have to publish them. The first prize of $50 was awarded to William G. Reyer, general foreman of the Nashville, Chattanooga & St. Louis at Nashville, Tenn., and the second prize of $25 to George H. Roberts, assistant machine foreman of the New York, New Haven & Hartford at Readville, Mass. Among the other manuscripts which deserve mention because of their excellence, and with no attempt to arrange them in the order of their merit, are those submitted by C. J. Drury, general roundhouse foreman of the Atchison, Topeka & Santa Fe at Albuquerque, N. Mex.; J. S. Sheafe, mechanical inspector of the Illinois Central at the Burnside shops, Chicago; C. L. Alden, foreman heavy freight car repairs, New York Central & Hudson River, West Albany, N. Y.; Elmo N. Owen, general foreman, Southern Pacific, Bakersfield, Cal.; Edgar T. Spidy, instruction card inspector, Canadian Pacific, Angus shops, Montreal; W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.; O. D. Buzzell, general foreman car department, Atchison, Topeka & Santa Fe, San Bernardino, Cal.; J. T. McSweeney, smith shop foreman, Baltimore & Ohio, Mt. Clare shops, Baltimore, Md.; also a manuscript from a foreman of a southern railway, who does not wish to have his name known, referring largely to the handling of locomotives at terminals. The two best papers and one of the others are published in this issue; the remaining ones will appear in a later issue.

Another shop kink competition will be held, to close June 15. As in the previous competitions, there will be a first prize of $50 and a second one of $25. Those who are not awarded prizes, but whose kinks are considered worthy of publication, will be paid at our regular space rates. The awards will be based on the best collection of from three to five kinks, although there is no objection to the competitors sending in a greater number, allowing the judges to base their decision on what they consider to be the best five in the collection. Please make the descriptions of the kinks and their operation as complete as possible. Many of the descriptions which have been received in former contests have been so brief as to leave much to the imagination of the judges. Remember that the reader has only a drawing or a photograph to look at, and some things which may be perfectly plain while watching the device in operation do not appear clearly on the drawing and must be carefully explained. Shop kinks are devices to make a saving in time or labor, and their value will be more apparent if a statement is made as to the increase in efficiency due to their use, or of the average time which is required to turn out a piece of work with them.

It has been suggested that more attention be given in our columns to the work of the car repair department. The statement has also been made that although there are about 40 cars to every locomotive in this country, the technical journals have, to a great extent, overlooked the interests of the car department and have concentrated their attention on the locomotive repair shops. That this is, in some degree, true is due to the fact that the work of the car department is not so complicated and does not require such extensive and elaborate equipment as does the locomotive repair shop. On the other hand, the modern car repair shop, handling both freight and passenger cars, does a great variety of work requiring considerable special equipment and should offer a fruitful field for special devices and methods for saving time and labor. This is specially true where it is necessary to repair steel underframe or all-steel equipment.

To meet the demand for information concerning the work of this department we have in preparation a series of articles entitled "Car Repair Shop Notes," the first of which appears in this number. To some of our readers certain of the devices described in connection with the Erie car shops at Buffalo may appear almost too simple or too common to warrant mention. Visits to several other car repair plants have demonstrated, however, that work similar to that which is being done by these apparently simple and common devices is being performed by much more complicated or awkward devices or methods at other plants. It will, therefore, be the intention, in this series of articles, to draw attention to all devices or methods, no matter how simple, which are used to advantage in any one shop or repair yard, but which are not found to be in general use in other shops.

Unfortunately most of us are so constituted that we are inclined to give entirely too much attention to the details of our work and not enough to the fundamental principles which underlie it. Again, the proper principles for the upbuilding of an organization may be determined, but as the work progresses they may be largely lost sight of or be distorted in working out the details. To successfully and continuously keep up a high efficiency it is necessary to have the fundamental principles always clearly in mind.

On another page Harrington Emerson outlines what he considers to be the twelve fundamental principles underlying efficiency work. Some of those familiar with Mr. Emerson's work may disagree with him as to the way in which these principles should be applied, but they must admit the correctness of the principles. Successful managers or organizers, whether in the railway shop, the repair yard or some other department of a railway, or in industrial plants, may express their ideas in a different form, but in general they agree closely with Mr. Emerson. In looking back over your experience, do you find that your success has been due to the use of some or all of these principles? Would not your success have been greater if you had made use of all of them?

In adopting the basic principles relating to the handling of apprentices, as recommended by the Master Mechanics' Association, there is a tendency on some roads to give too much attention to the schoolroom work and not enough to the shop work. At several shops where efforts are being made to improve the courses of instruction, first-class schoolrooms have been provided and equipped and good instructors have been placed in charge, but no shop instructors have been appointed to see that the apprentices are properly instructed in shop work. As the object of apprenticeship is to make good me-

chanics, it would seem that greater stress should be placed upon the training in the shop. On the New York Central Lines there is an instructor at each shop whose duty it is to look after the apprentices in the shop and see that they are properly instructed on each job and that they are shifted from one class of work to another at proper intervals to give them a thorough training in the trade. At the Topeka shops of the Atchison, Topeka & Santa Fe, where there are about 170 apprentices, ten shop instructors are employed, and it is considered to be a paying proposition, although it was not the intention of the Santa Fe to commercialize the apprenticeship work. That company does not make any regular appropriation for the apprentice work, but it is considered a regular part of the shop expense and is so charged. It has been found that the work of the drawing room and shop instructors has made it possible for the apprentices to do a great deal more and a much better class of work than formerly.

LOCOMOTIVE REPAIRS WITHOUT REMOVING DRIVERS.

A large part of the labor in the construction of new locomotives is expended in roughing out and finishing forgings and castings, and the cost of labor in erecting the parts is only about 16 per cent. of the total labor charge. A large part of the labor involved in repairing locomotives is required to take the machinery apart, clean it, distribute it to the various machines or benches and then return the parts to the erecting shop and put them together. The principal machine work is in taking up wear, and it does not require the renewal of the larger parts or expensive roughing out and finishing. The labor of handling the parts in mounting and dismounting in the erecting shop or roundhouse thus becomes the principal item of the labor charge, and in the effort to economize the cost of labor in locomotive repairs this charge can be reduced by less frequent shoppings and by special methods of construction which enable the driving bearings to be removed and refitted without removing the drivers. It is the general practice to shop locomotives once a year for heavy repairs, and the number of repair pits required is usually calculated on this basis. Freight locomotives do not average more than 40,000 miles per year and passenger engines 80,000 to 100,000 miles. After making this mileage they are taken to the shop where the machinery and running gear are all removed, leaving the bare boiler and cylinders.

With large locomotives the mere handling of all these heavy parts is laborious and expensive and probably exceeds the actual cost of the machine work in making repairs. The aim should be, therefore, to keep the engine out of the shop as long as possible, having proper regard to excessive lost motion and injury to track due to worn tires. The extent to which this can be carried is illustrated by occasional records of very high mileage between general repairs, and if the same care is exercised in the construction and operation of other locomotives there is no good reason why such records should not become more numerous. On the Cleveland, Cincinnati, Chicago & St. Louis a Pacific locomotive hauled nine heavy passenger cars 288 miles per day, and from November, 1907, to December, 1909, made 200,580 miles without shop repairs. No new tubes were put in; no tires were turned. The engine received only light repairs in the roundhouse between trips. It was operated by double crews and kept in excellent condition by their careful attention. The left main wedge was lined down four times and the right one twice, thus preventing the locomotive from pounding on its boxes.

Another record of high mileage between general repairs was made by a Baldwin balanced compound Atlantic type on the Santa Fe. It hauled a heavy passenger train 364 miles per day, and from the time it was delivered new until it required general repairs it made 227,900 miles. The conditions under which such remarkable service is obtained should be investigated, and the aim should be to bring up the average mileage between shoppings to something approaching these figures.

The heavy labor cost which attends the removal of driving wheels in the ordinary roundhouse has suggested to some motive power officers the possibility of making most running repairs to locomotives without removing the driving wheels. One cause for removing drivers is the necessity of renewing tires on account of flat spots, irregular wear, or thin flanges. On some roads it is now the practice to renew tires without removing the wheels. With a good gas heater and exact gages for boring tires for proper shrinkage, this has been made possible, the time required for tire renewal being greatly lessened, and the cost of the repairs being largely reduced. Driving boxes with removable brass bearings, which may be removed without dropping the drivers, have been in successful use for several years, and this is now the established practice of one large railway. Designs have also been made for driving boxes with dovetailed removable hub liners, so that these can be renewed without performing the laborious task of taking out the drivers for so small an item of necessary repairs.

Pursuing the scheme still further, plans have been made for, and locomotives are now building with frames having flanges on the pedestal faces the full width of the box fit, so that flangeless shoes and wedges can be used, and on engines with underhung springs the shoes and wedges can be removed without taking down the spring rigging. With the Walschaert valve gear where eccentrics and link motion have been removed from between the drivers and the space is clear, the locomotive construction lends itself to modifications of the usual driving gear details for the purpose of reducing the labor required in taking up wear and renewing the heavy bearings, by such methods as are described above. This is an interesting development and one adapted to effect large economies in locomotive running repairs and to increase mileage between shoppings. It is expected that a paper on the subject, describing more fully the possibilities as well as actual experience with some such new designs and with illustrations of them, will be presented at the next convention of the Master Mechanics' Association.

LOOSE TIRES.

The frozen track of the lines in the Northwest has been rough and rigid during the past winter to a degree unparalleled in a generation, and it has resulted in the fracture of large locomotive details to an alarming extent. The breakage of main frames, rods and crank pins has been more than double that of the winter months of previous years. The number of loose and broken tires has also been unusually large, and it has demonstrated that the ordinary methods of fastening tires are not sufficient for such unusual conditions. Quite a number of tires have broken with a clean fracture, showing that the combined stresses due to shrinkage and severe blows were equal to the resistance of the steel section.

The tendency of tires to become loose depends to some extent on the diameter, thickness, shrinkage and the method of fastening. The Master Mechanics' Association in 1907 adopted standard shrinkage allowances for tires, which are the same for cast iron and cast steel wheel centers, and, while general experience may have recommended such a rule, it is certain that the compressive strength of the two kinds of centers is not the same and that many of the cast steel centers offer less resistance to compression than those made of cast iron. At the time the new rule was adopted the shrinkage for centers above 66 in. was made 1/60 in. per foot of diameter and 1/80 in. for centers less than 66 in. The standard area of the spokes for cast steel centers was at the same time increased to 5.9 sq. in. at the small end and 9.8 sq. in. at the large end. This has materially improved conditions and reduced the compression of cast steel centers, but there are in service

numerous centers with spokes having a much smaller cross-section, which will continue to give trouble by excessive compression due to the flexure of the spokes, causing loose tires. With tires held in place by shrinkage only much depends on the area of the metal subjected to compression, and the larger this area with a given compression, the more secure will be the fastening. Many driving wheels, both steel and iron, have a circumferential core 1½ to 2 in. wide, which reduces the bearing area nearly one-third, but the present Master Mechanics' standard for wheel centers without retaining rings shows a solid rim 5 in. wide with a tire bearing over the whole surface.

Another condition which affects the extent of the tire bearing area is the smoothness or roughness of the finish of either the tire or the wheel center. If these are finished with a pointed tool and rapid feed the corrugated or serrated surface thus produced causes the tire to rest on these high edges instead of on the broad surface of a smooth finish. With the pressure of the shrinking tire, the high ridges are crushed and the tension of the tire tending to hold it on the center is reduced. It is thus easily possible to create conditions by rough finish which will eventually cause loose tires. When tires are changed at a roundhouse without removing the drivers, the work may not be done with as great accuracy as in the shop, where there are better facilities and where the tires are changed so frequently that the men are more skilled. This may to some extent explain the loosening of tires.

The majority of tires on American locomotives are held in position entirely by the pressure due to shrinkage, and this has a very uncertain and indefinite value. If the center was entirely rigid the large amount of shrinkage now used would not be permissible, as the stress produced in the tire would be over 40,000 lbs. per sq. in.; but this is largely reduced by the amount of compression of the center, which depends on the conditions we have above considered, so that it is impossible to calculate with any degree of accuracy the magnitude of the force tending to hold the tire securely in position. For this reason the fastening of tires by shrinkage only must be regarded as not entirely safe or satisfactory for large drivers. The pressure tending to hold the tire on becomes less as the tire is worn and the area of the section which resists stress is correspondingly reduced. For this reason all railways have adopted limits of thickness for the last turning and limits of wear for tires in different classes of service. These limits vary with different lines, but they do not appear to have been made larger for the Northern lines, where the service is the most severe.

The limit of thickness of the tire for the last turning for passenger engines with large wheels varies from 1¾ in. to 2¼ in., the large limit being used by lines to the south of those allowing the smaller thickness. For the limit of wear there is a variation from 1½ in. for the Northern district and 2 in. for the Middle Western lines. For heavy freight engines, some Northern lines allow tires to be turned down to 1⅝ in. and to wear down to 1⅜ in., while others further South make these limits 2¼ in. and 2 in., respectively. A tire worn to, say, 1½ in. thick has already been slightly elongated by the rolling effect, and its area of cross-section is so small that it would stretch slightly under shrinkage stress, and either of these things may be sufficient to cause it to become loose.

The Master Mechanics' standard drawing for wheel center and tire, without retaining ring, shows the tire with a lip ⅛ in. deep and ⅜ in. wide on the outer rim. This is a useful safeguard against tires falling off when slightly loose, but it is not generally used. It requires a little more time and care in boring the tire, but is comparatively inexpensive and should be adopted for the large and heavy freight locomotives now in use. For passenger engines the best protection against loose tires is the retaining ring, but this, too, is not used to any great extent on Western lines. An inquiry as to the practice of lines west of Chicago shows that eight railways do not use retaining rings for tires on the larger drivers of express passenger locomotives, while one company has adopted it for all large passenger engines, and another uses it on 84-in. drivers only.

The experience of the past winter will doubtless lead to better practice in fastening tires. For the larger freight engines the inside lip on tires should be adopted and the limits for the last turning and for the tire wear should be increased. For passenger engines retaining rings should be used on all the larger drivers, and for all sizes, both freight and passenger, greater care should be taken to finish the bearing surface of both tire and center to a smooth surface.

HIGH DUTY DRILLING MACHINES.

Drilling machines have been redesigned and improved so as to work under the ordinary speeds and pressures required by high speed drills, but until recently no machines have been made which would drive the best steel drills up to the maximum capacity. Seventy feet per minute has been regarded as a good cutting speed, and .012 in. per revolution as normal feed, while 8 to 10 horse power motors have been thought sufficient for the heavier drill presses used in locomotive shops. In order to take advantage of the remarkable cutting power of the high speed drills now on the market the American Locomotive Company has had the tool makers design special drilling machines, with sufficient capacity to drive any of the drills to the limit of their endurance in drilling one hole in hard machinery steel.

The tests of these machines have shown remarkable results. An indication of the power of the new drill press is afforded by the use of an 8-in. belt and the consumption of over 50 h.p. in forcing a 1½-in. drill through 10 in. of steel in one minute. The cutting speed has been increased to 123 ft. per minute, and the feed per revolution to as high as .04 in. Running at 284 revolutions per minute, with a feed .04 in., a 1½-in. drill removed 20 cu. in. of steel per minute, and the depth of hole drilled per minute was 11.36 in. This work consumed over 60 h.p., as measured by the output of the electric motor, but it wore out or broke the drills, overheated the belt and far exceeded the capacity of the drills or the machine for regular useful work. Having obtained a drilling machine of sufficient power to use up the drills it will now be possible to determine the feeds and speeds for drills of different diameters, which will give the greatest output in useful work, having proper regard to economy in the cost of renewing the drills.

Working under such heavy duty it will be found necessary to force the cooling liquid to the point of the drill and some changes in its composition may be found necessary. The equality of the steel in the drills may be further improved to meet the new conditions, and when this process of forcing removal of metal by drilling is well developed the drill press will become a new and different tool from what it has been in the past. When it is made a high speed and a high power machine it may compete with some of the other standard tools which are used in shaping out rough forgings, such as the slotter or the cold saw. The slotter has the same drawback as the planer in being a reciprocating machine which is idle during the return stroke, and the drill press, having a continuous operation like the milling machine, may be used to advantage in place of the slotter. In working out the bearing seats of solid end main rods, or similar work, it is possible that the core could be roughed out by a high power drill in a shorter time than by slotting. Slots and keyways, which depended on the old and slowly opertaing drill press for their cutting, will be produced much faster and the time usually taken for drilling the numerous holes in locomotive details will require complete readjustment when the heavy duty high speed drill comes into use.

Contributed Papers.

THE MOTIVE POWER DEPARTMENT ORGANIZATION OF THE CHICAGO, BURLINGTON & QUINCY.

BY M. K. BARNUM,
General Inspector Machinery and Equipment, C., B. & Q.*

An intimate connection with several large railways and a study of others justifies the assertion that the mechanical department of the Chicago, Burlington & Quincy has one of the most efficient, logical and simple organizations to be found. This opinion is supported by the results obtained during the recent severe winter with its extreme cold, heavy snows, shortage of power and large volume of freight business. Under these unfavorable conditions the locomotives of the Burlington averaged over 10,000 miles per engine failure (two minutes delay to a passenger train or five minutes to a freight), while some of the other good roads averaged less than 5,000 miles, and one western road made only about 900 miles per failure. This record could only have been made by keeping the power in excellent condition. The condition in which it was kept was such that the number of locomotives held out of service for repairs over 24 hours averaged but 8.2 per cent. of the total number owned, while very few other roads had less than 12 to 15 per cent., and one had 25 per cent. of its motive power shopped.

The accompanying charts show graphically the relations existing between the various officers, but some explanations are necessary for a clear understanding of the authority and duties of each position.

THE GENERAL ORGANIZATION.

On account of the large territory covered by its nearly 10,000 miles of line, the Burlington system is divided into two grand divisions which are officially designated as the Lines East of Missouri River and the Lines West of Missouri River. For brevity they are commonly spoken of as "Lines East" and "Lines West."

Each grand division has a general manager, who reports to the vice-president in charge of operation in Chicago, and has his complete staff of officers. The general manager of the Lines East is located in the general offices at Chicago, but the headquarters of the Lines West are in Omaha, where the general manager is the highest ranking officer.

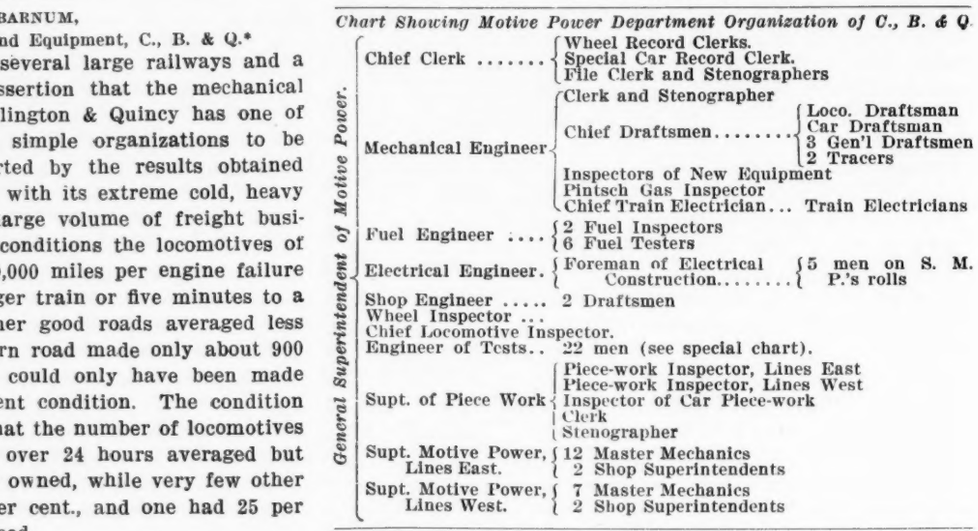
Although Omaha is 500 miles from Chicago, the general manager of the Lines West is over 1,000 miles from the extreme limit of his line in the Northwest, which is about 1,550 miles from Chicago. These distances furnish a brief but sufficient explanation why the Burlington requires a somewhat different organization in general, and for the mechanical department in particular, from that which has been found to meet the needs of such roads as the Lake Shore and the New Haven.

The Burlington has about 1,200 passenger cars, 55,000 freight cars and 1,600 locomotives. The equipment will be substantially increased when present orders for new rolling stock are filled.

THE GENERAL SUPERINTENDENT OF MOTIVE POWER.

The general superintendent of motive power reports to the vice-president in charge of operation, but co-operates and keeps in touch with both general managers, the general superintendent of transportation and the purchasing agent. He is an executive officer in every respect and allows more authority to all members of his staff than is customary on other roads. This practice stimulates initiative and pride in their work and has obtained the very best of results, as it relieves the general superintendent of motive power of less important details and permits him to devote more time to the larger mechanical questions. His chief clerk handles all of the routine matters, including correspondence not requiring his personal action. The working lines are not sharply defined between the various men on the staff of the general superintendent of motive power, and special investigations are often assigned to one or the other as may seem best under existing circumstances. The accompanying diagram of the motive power department organization shows clearly the members of and the arrangement of the general superintendent of motive power's staff.

Chart Showing Motive Power Department Organization of C., B. & Q.



MECHANICAL ENGINEER.

The mechanical engineer has more than the usual authority and responsibility, as he supervises not only the designing of new cars and locomotives, but also the train lighting and the shopping of passenger cars. The inspectors who represent the railway at the car and locomotive builders' shops report to him. He also looks after the improvements in arrangement, heating, lighting, etc., of passenger cars and performs many of the duties that are usually done by the master car builders of other roads. The duties of the various men on his staff are pretty clearly defined by their titles and seem to need no further explanation.

FUEL ENGINEER.

The fuel engineer looks after the distribution and inspection of locomotive fuel and takes personal charge of all coal tests on locomotives. He recently made a series of tests to determine the shrinkage of coal when exposed to the weather for various lengths of time. The coal analyses are made by chemists in the laboratory under supervision of the engineer of tests.

The purchasing agent buys all fuel and watches the demand and supply at all points on the road, but the fuel engineer and his men co-operate with him and inspect it at the mines, check the scale weights and, in short, see that the railway receives the amount and quality of coal for which it contracts and pays.

ELECTRICAL ENGINEER.

The electrical engineer attends to the plans for and installation of electrical apparatus for power and light in shops and other company buildings, but the train electrician, under direction of the mechanical engineer, looks after the train lighting matters.

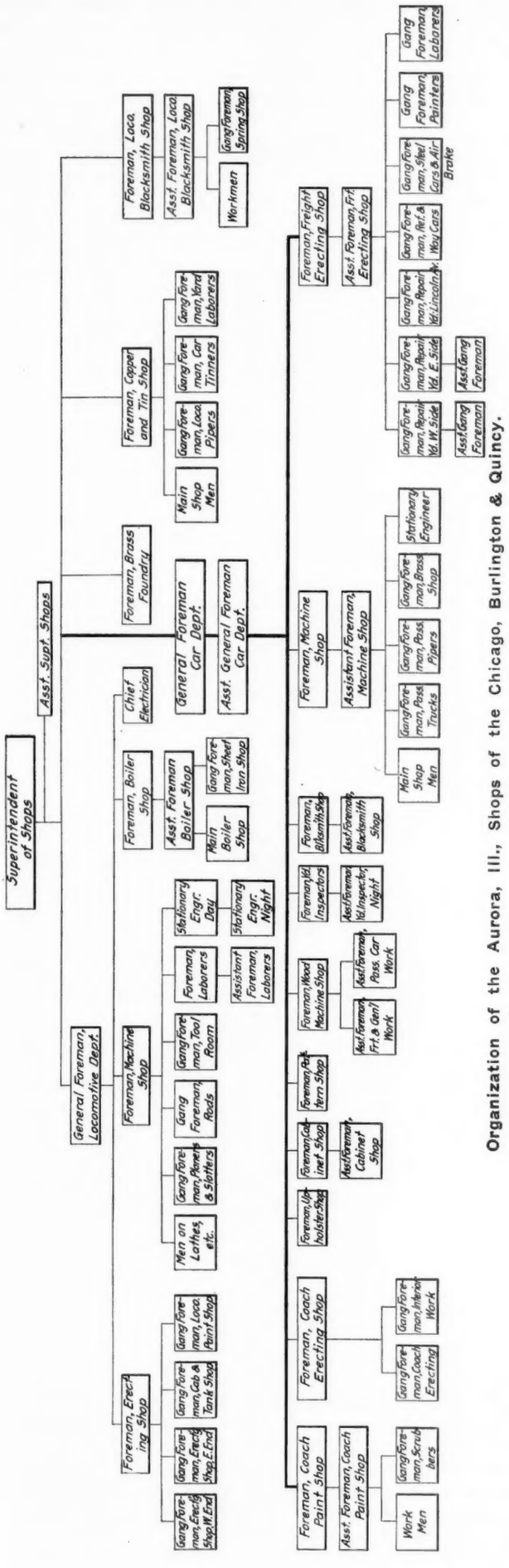
SHOP ENGINEER.

The shop engineer studies all questions of shop design and improvements, and has two draftsmen who work up the details of changes in power plants, etc. At present he is giving most of his time to the building of the new shops at Havelock, Neb., developing some details and inspecting the construction as it progresses under a contract with Westinghouse, Church, Kerr & Company.

WHEEL INSPECTOR.

The wheel inspector looks after the inspection and testing

*Since writing this article Mr. Barnum has been appointed general superintendent of motive power of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley.



Organization of the Aurora, Ill., Shops of the Chicago, Burlington & Quincy.

of cast iron wheels at the foundries, inspects wheels that have failed to meet the guarantee and follows up all questions arising in connection with the fitting up and use of wheels at the various shops and on the road.

CHIEF LOCOMOTIVE INSPECTOR.

The chief locomotive inspector receives and studies the reports of defective machinery, follows up the performance of new devices on locomotives, such as superheaters, draft appliances, valve gears, etc., and makes such special investigations as may be directed by the general superintendent of motive power. He is thoroughly familiar with shop and locomotive practice, and is a most useful member of the staff.

ENGINEER OF TESTS.

The engineer of tests has charge of the chemical and physical laboratories at Aurora, Ill., of the test car when used for tonnage ratings and of most other testing work, except coal tests which are supervised by the fuel engineer. There are usually about 22 men on the rolls of the engineer of tests, as shown on the chart, which also indicates the duties performed by most of them.

Engineer of Tests	Assistant Engineer of Tests.	Clerk Stenographer 3 Mechanical Assistants 7 Chemists 2 Helpers Water Engineer Water Inspector 5 Material Inspectors

The three mechanical assistants are principally occupied with tonnage ratings, brake shoe tests and other similar work in the physical laboratory or on the road. The water engineer spends most of his time on plans for improving the quality of water supplied for boilers, while the water inspector follows up the improvements already made and sees that arrangements for water treatment are kept up so that the expected results will be obtained. The material inspectors visit the various mills, foundries and factories where they inspect supplies, ordered by the purchasing agent, before shipment.

SUPERINTENDENT OF PIECE-WORK.

The superintendent of piece-work has general supervision over the methods and prices used for piece-work in all shops of the system. Probably the success of piece-work on the Burlington has been due more to the ability and personality of the superintendent of piece-work than to any other one man, although all of the officials of the mechanical department, from the general superintendent of motive power to the master mechanics, foremen and piece-work checkers, are entitled to much credit. The superintendent of piece-work makes up the schedule of prices for all shops, but the price recommended for each particular job originates with the foreman and inspector directly in charge of the job and is fixed after a fair trial and agreement with the man doing the work. After approval by the general foreman and master mechanic or superintendent of shops the price is passed upon by the superintendent of piece-work, who then sends it to the superintendent of motive power for final approval.

The superintendent of piece-work spends most of his time visiting the various shops adjusting questions that arise about prices and methods of work. He knows intimately most of the piece-workers and has been kept busy of late adjusting the numerous increases in piece-work prices which have followed the raises in day rates.

SUPERINTENEDNT OF MOTIVE POWER—LINES EAST.

The superintendent of motive power of the Lines East has supervision over fourteen master mechanics and superintendents of shops in charge of 1,020 locomotives. The duties of most of the men on his staff, as shown on the accompanying chart, are sufficiently described by their titles, but a few need some explanation.

The piece-work inspector has also been shown on the staff of the superintendent of piece-work, as he reports jointly to him and to the superintendent of motive power. The foreman

of construction equipment supervises the repairs to pile-drivers, steam shovels, derricks, etc.

Chart Showing Organization of Superintendent of Motive Power of Lines East.

Supt. of Motive Power—Lines East.

- Chief Clerk ..... — Clerks of Car and Loco. Records; Bill Clerks, File Clerk; Stenographers
- Assistant Chief Clerk
- General Car Inspector
- General Boiler Inspector
- Piece-work Inspector
- Air-brake Instructor
- Mechanical Inspector ..... — Speed Recorders and Miscellaneous Work
- Mechanical Inspector ..... — Fuel Economy and Special Duties.
- Foreman of Construction Equipment.
- Supt. of Aurora Shops..... — See special chart
- Supt. West Burlington Shops. — See special chart
- M. M., Chicago Division .... — 75 Locomotives—1 Road Foreman
- M. M., Aurora Division ..... — 147 Locomotives—2 Road Foremen
- M. M., Galesburg Division.... — 125 Locomotives—2 Road Foremen
- M. M., La Crosse Division.... — 75 Locomotives—1 Road Foreman
- M. M., Beardstown Division.. — 74 Locomotives—1 Road Foreman
- M. M., Burlington Division... — 20 Locomotives.
- M. M., Ottumwa Division.... — 109 Locomotives—2 Road Foremen
- M. M., Creston Division..... — 62 Locomotives—1 Road Foreman
- M. M., St. Joseph Division... — 125 Locomotives—2 Road Foremen
- M. M., Hannibal Division.... — 75 Locomotives—1 Road Foreman
- M. M., Brookfield Division.... — 84 Locomotives—1 Road Foreman
- M. M., Centerville Division .. — 49 Locomotives—1 Road Foreman

The shops at Galesburg, Ill.; La Crosse, Wis.; Beardstown, Ill.; Creston, Iowa, and St. Joseph, Mo., are small, having only four to six locomotive erecting pits, and come under the division master mechanic, with a general foreman in full charge. The Hannibal, Mo., shops hold twelve locomotives, but are also under the division master mechanic, as his division is compact and has but 75 locomotives.

The Aurora, Ill., and West Burlington, Iowa, shops repair cars and locomotives for all divisions, being the largest shops on the Lines East, and their importance and the number of men employed make it expedient to have a superintendent of shops in charge who has no responsibility for locomotives, enginemen or other matters pertaining to the handling of trains. The organizations of the Aurora and West Burlington shops are shown on separate charts as they differ in size and details.

THE AURORA, ILL., SHOPS.

These shops are located 37 miles from Chicago and handle all the heaviest passenger car repairs for the system. The force varies between 1,200 and 1,500 men. This shop is an excellent example of what can be accomplished in old and inadequate shops with fairly good machinery, a thoroughly efficient organization and first class supervision. The passenger car erecting and paint shops hold only 32 cars but turn out about 60 cars a month, with paint and varnish and general repairs, when running to their full capacity.

The locomotive shops give general repairs to about 18 engines a month and build some new switch engines, but the erecting pits are in an old roundhouse which is too small to take in any of the heavy power purchased during the last seven or eight years.

WEST BURLINGTON SHOPS.

These shops handle the heaviest locomotives and with a force of about 500 men turn out 22 to 24 engines a month, and also make heavy repairs to a large number of freight cars, but no passenger cars are now overhauled there. The organization is shown in full on the accompanying chart which does not seem to need any further explanation.

Locomotive cylinders and other large castings are made in a local foundry and machined in this shop before shipment to the division shops where they are to be applied; also the boilers for new locomotives are usually made here with a hydraulic riveter even though the work of erection may be done at the Aurora or Havelock shops.

SUPERINTENDENT OF MOTIVE POWER—LINES WEST.

The superintendent of motive power of the Lines West has under his supervision nine master mechanics and superintendents of shops and about 555 locomotives which run over nearly 5,000 miles of line, as the Lines West comprise about one-half the mileage of the Burlington system, although using only about one-third of the total number of locomotives.

The plan of organization is similar to that of the Lines East, as previously described, but there are less men on the superintendent of motive power's staff. The shops at McCook, Neb.; Alliance, Neb., and Sheridan, Wyo., hold only 4 to 6 locomotives and come under the supervision of the division

Organization of the West Burlington Shops.

Supt. of Shops.

- Chief Clerk
  - General Time-keeper
  - Assistant Chief Clerk
  - 4 Clerks
  - Stenographer
  - 2 Office Boys
- General Foreman Loco. Dept.
  - Timekeeper
  - Clerk
  - Machine Shop Foreman
    - Foreman
    - 2 Piece-work Inspectors
    - 38 Machinists
    - 25 Handy Men
    - 10 Helpers
    - 15 Machinist Apprentices
    - Wh'l Gang Boss ... 4 Handymen; 5 Helpers
  - Erecting Shop Foremen (2)
    - Piece-work Inspector — 1 Clerk
    - 22 Machinists
    - 10 Handy Men
    - Pipe Gang Foreman—7 Pipe Men
    - 3 Apprentices
    - 11 Helpers
    - 3 Crane Men
    - Boiler Maker
  - Supply Foreman
    - Clerk
    - 2 Delivery Men
  - Bl'ksmith Shop Foreman
    - Clerk
    - 16 Blacksmiths
    - 2 Forgers
    - 2 Frame Makers
    - 3 Heaters
    - 20 Helpers
    - 5 Hammer Boys
    - Supply Man
    - Laborer
    - 2 Firemen
  - Boiler Shop Foreman
    - Clerk
    - 14 Boilermakers
    - 11 Machine Men
    - Flue Welder
    - 2 Ash Pan Men
    - 21 Helpers
    - Boiler Washer
    - 9 Apprentices
    - Supply Man
    - 2 Laborers
    - Flange-fire Heater
    - Machinist
  - Tin Shop Foreman
    - 4 Tinsmiths
    - Coppersmith
    - Laborer
  - Machine Rep'r Gang F'rm'n
    - 9 Machinists
    - 2 Helpers
  - Lbr. Gang Boss
    - Boss Engine Cleaner — 10 Laborers
    - 43 Laborers
  - Loco. Paint Gang Boss — 5 Painters
  - Engin'r Power Plant — 7 Firemen
  - Steam Pipe Fitters (2) — 3 Machinist Helpers
  - Engine Tamer and Helpers
  - Yard Engineer and Helper
  - Electrician and Helper
  - Pumper
  - 3 Watchmen
- General Foreman Car Dept.
  - Repair Track Foreman
    - Gang Boss
    - Piece-work Inspector
    - 3 Car Inspectors
    - 68 Car Repairers
    - 64 Trucksmiths
    - 2 Air-brake Men
    - 2 Oilers
    - 13 Laborers
    - 2 Supply Men
    - 4 Clerks
    - Bench Carpenter
    - Door Maker
  - Coach Repair Shop Formn
    - 14 Carpenters
    - 4 Trucksmiths
    - Upholsterer
    - 2 Laborers
  - Wood-Mill Foreman
    - Clerk
    - 10 Wood Machinists
    - 5 Helpers
    - 2 Scrap-saw Men
    - Saw Filer
    - Oiler
    - 10 Laborers
  - Car Paint G'ng Boss — 7 Painters
  - Wrecking Foreman — Craneman
  - 2 Mill Wrights
- Pattern Shop Foreman
  - Assistant Foreman
  - 2 Pattern Makers
  - Apprentice
  - Laborer
- Draftsman
- 2 Special Apprentices
- Stenographer
- Blue-print Clerk
- Janitor

master mechanic who has a general foreman to handle the details. Each master mechanic has charge of the outlying roundhouses on his division. The Denver roundhouse and passenger yard are under a general foreman reporting to the

Chart Showing Organization of Superintendent Motive Power—Lines West.

Supt. Motive Power, Lines West

Asst. Supt. Motive Power

Chief Clerk	Assistant Chief Clerk Car Record Clerk Bill Clerks 6 File Clerks, etc. Stenographers	
General Car Inspector		
Gen'l Boiler Inspector		
Piece-work Inspector		
Air-brake Instructor		
Chief Draftsman		
Supt. Havelock Shops	See special chart	
Supt. Plattsm'th Shops	See special chart	
M.M., Omaha Division	1 Road Foreman—	70 Locos.
M.M., Lincoln Division	2 Road Foremen—	95 Locos.
M.M., Wymore Division	1 Road Foreman—	72 Locos.
M.M., McCook Division	2 Road Foremen—	107 Locos.
M.M., Alliance Division	2 Road Foremen—	87 Locos.
M.M., Sterling Division	.....	38 Locos.
M.M., Sheridan Divis'n	2 Road Foremen—	86 Locos.

McCook master mechanic; the roundhouses at Edgemont, S. D., and Deadwood, S. D., are under the master mechanic at Albany, Neb.

ROAD FOREMAN OF ENGINES.

Each division has one or two road foremen who are, in effect, assistant master mechanics, having supervision over the enginemen and following up the condition and operation of locomotives on the road. One road foreman cannot properly look after more than about 100 locomotives and a corresponding number of enginemen, and on the Lines West, where several divisions have from 340 to nearly 400 miles of main line, besides branches, two road foremen have been found desirable for 85 or more locomotives. The road foremen examine enginemen for employment and promotion, investigate all but the more serious infractions of rules and have given most efficient assistance to the master mechanics in reducing the number of engine failures and improving the locomotive service generally. Road foremen are always selected from among the most capable locomotive engineers, due weight being given to their personal habits and executive ability; many of the master mechanics, some superintendents and one superintendent of motive power have made their first step from the ranks as road foremen of engines. They co-operate with the superintendent and trainmaster, but report to the master mechanic, by whom they are selected and appointed with the approval of the superintendent of motive power.

HAVELOCK LOCOMOTIVE SHOPS.

This shop, located seven miles from Lincoln, Neb., maintains all the modern power belonging to the Lines West, and can give general repairs to about 400 large locomotives a year. A new machine and erecting shop, new power plant and general storehouse will be built and ready for use before next winter, which will increase the capacity of this shop 50 to 75 per cent. The chart shows the shop organization which is unusually simple, but very efficient. No car work is done here as running repairs are made in the Lincoln yard and general repairs at the Plattsmouth shops, only 50 or 60 miles away.

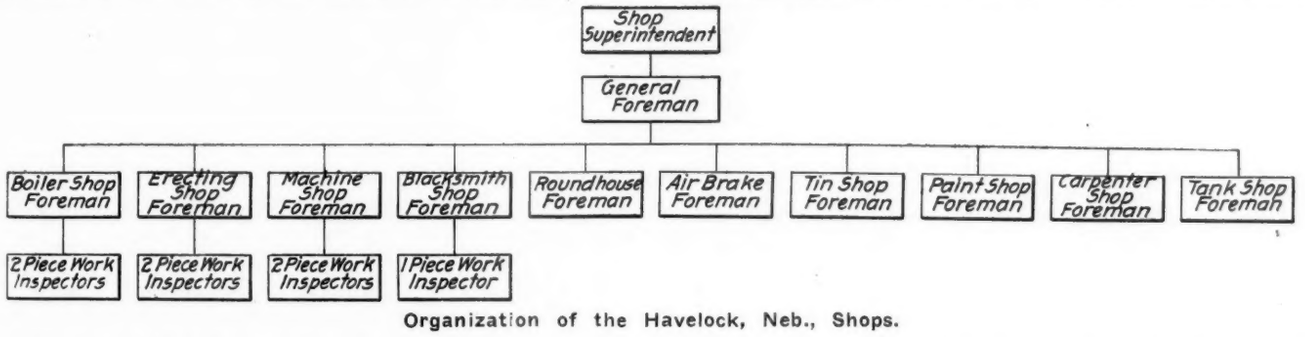
PLATTSMOUTH, NEB., SHOPS.

This is the oldest shop on the Lines West and is now limited to car work. A large number of freight cars receive heavy repairs and the passenger car work is second in importance only to that done at Aurora, as between 30 and 40 cars a month are painted, varnished and given other necessary repairs, during the season when the cars can be spared from service and are being prepared for the heavy summer passenger travel. The organization here is also quite simple, but efficient, and the chart indicates pretty clearly the duties of each position.

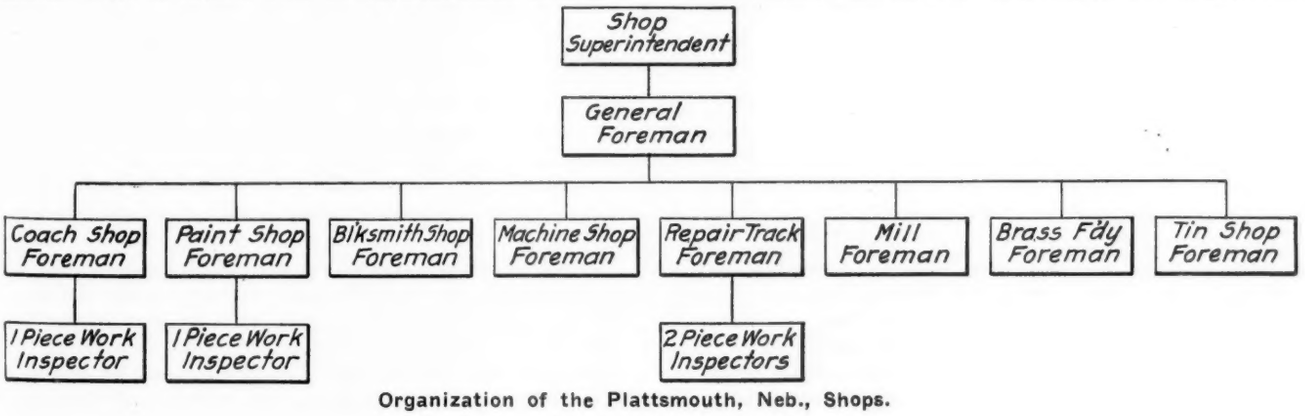
GENERAL NOTES.

Although this mechanical department organization has proved very efficient, it might possibly be still further strengthened by the addition of a master car builder or an assistant general superintendent of motive power reporting to the general superintendent of motive power and having exclusive jurisdiction over all car work. This would relieve the mechanical engineer of much work which now causes him at times to be overloaded, and the increased supervision over car repairs would undoubtedly be a profitable expenditure for the company.

The Burlington has for many years followed civil service rules in filling official positions and makes all foremen and master mechanics by promoting men from the ranks, or from lower positions, so there are many cases of men who have been in this company's service over forty and some even fifty years.



Organization of the Havelock, Neb., Shops.



Organization of the Plattsmouth, Neb., Shops.

HOW THE FOREMAN CAN PROMOTE SHOP EFFICIENCY.

FIRST PRIZE ARTICLE.

BY WILLIAM G. REYER,
General Foreman of the Nashville, Chattanooga & St. Louis, at Nashville, Tenn.

To be capable of promoting shop efficiency, a foreman should be able to readily read human character; also a man of ideas, quick to grasp any shop kinks and willing to take any good suggestions, even if offered by an apprentice. He should be capable of looking ahead and of keeping his men at work so they can do the greatest amount of work economically. He should work out plans to shorten labor as much as possible, not overlooking good workmanship, and at all times setting a good example to his men by his interest in his work and his hustling to push it.

The foreman should be in his shop when the whistle blows to see that his men start to work on the dot instead of hanging around in groups of two or more talking and discussing the topics of the day. Further, he should not permit his men to come to work five and ten minutes late; this makes a bad impression in the shop. He should be able to place his men to the best advantage, following them up during the day and seeing that they do not neglect their work, always treating them in a gentlemanly manner, and, above all things, not playing favorites; treat all employees alike at all times, especially so in the shop.

Your men should work with you at all times. If you find you have a laggard or kicker get rid of him at once. Keep tab on the number of hours it takes to do the different classes of work and when you have reached what you consider a good standard, see that the work is gotten out in the required time. Should your men begin to fall behind find out at once where the difficulties are, and if they can furnish no good reason give them to understand it will not be tolerated. Never let up on trying to shorten the time in getting out the work.

Foremen should at all times be ready to make improvements, as well as capable and willing, where a workman lacks in taking the best advantage of his work, to show him and see that he thoroughly understands the advantages of your methods. Short cuts sometimes reduce the cost and save lots of time. A foreman should keep abreast of the times, reading up on subjects that treat on his line of business. If you can get a trip to a more modern shop, always take advantage of it and see that you come away with some good points and are able to introduce and successfully carry them out in your own shop.

To get the best efficiency out of your men, be kind to them but firm, always letting them know that you mean exactly what you say and that your orders are to be strictly obeyed and carried out to the letter. Should you have to reprimand one of your men, send for him and lecture him privately; if this does not have the desired effect then resort to suspension or dismissal from the service, as the case may warrant. To abuse and reprimand employees in the presence of others will do no good, but tend to lower your standing in the estimation of those present.

The foreman should bear in mind that economy is one of the first essentials; always watch your scrap material and see that good serviceable material is not thrown in with the scrap, especially as relates to bolts, studs, nuts, washers, castings of various descriptions, etc., which are frequently thrown in the scrap in dismantling and then have to be replaced with new material in reassembling.

All mistakes should be thoroughly looked into and investigated to place the responsibility where it belongs. If you find that a workman through carelessness spoils a job, suspend him, and if the same thing happens the second time the best plan would be to dismiss him from the service. If an apprentice spoils a job, he should be reprimanded and made to understand that this kind of work will not be tolerated. Impress on his mind the fact that you are endeavoring to make a first class mechanic of him. The habits formed by an apprentice in the beginning follow him through life.

In securing apprentices a foreman should endeavor to get those who have a grammar school education; if you can take them on probation it is much better, as a young boy frequently starts at a trade that he is no more suited to than he is for flying. Should a foreman find an apprentice that is not adapted to learn the trade, he should transfer him to some other department or dismiss him from the service. A foreman should let the apprentice understand that he can come to him at any time for advice; always treat him in a manner that will encourage him to come to you for information, as it is the duty of the foreman to instruct and enlighten the apprentice to the best of his ability. A foreman should push the apprentice so that he will learn all branches of the trade and be sure that he is started right in the first place. Bear in mind that you cannot put a man's head on a boy's shoulders; some boys will have their pranks; they are so full of life that it bubbles over. This type of boy, as a general rule, makes the best mechanic. If you catch an apprentice at any of his pranks, etc., lecture him and let him know and understand that the shop is a place for work and not for play.

In handling men engaged on machine work, the foreman should find out just what class of work and kind of machine each man is best adapted to and place him accordingly. Some men, who are considered all-around machinists, can work better on certain machines than on others. At the present day with the various kinds and grades of high speed tool steels on the market, if a foreman will watch the feed and speed of the machine, he will be surprised at the amount of work it will turn out. Push the machine for all it is worth. If you have no demonstrator, take the best man you have on a machine and see just what the output of his machine is and see that other men come up to this standard.

A foreman should keep himself posted on the best machines on the market and not only recommend them but in a conclusive manner show the management the importance of securing them. If you are turned down once or twice on the question of new and improved machinery do not despair, but try again. We were after a certain machine two years ago and finally landed it and now consider it one of the best labor savers in railway machine shop work. This is a Landis taper bolt machine; since installing it we have made some changes whereby we not only turn the bolt but cut to proper length and thread it ready to be applied; this is all done on the one machine. Before this machine was installed holes were reamed in the erecting shop, then the lathe man would have to go to the engine to get the length and size of the bolt required and then turn it to suit. I have now installed taper reamers and templates whereby bolts are kept in stock and the erecting shop workmen get them out of stock and ream the holes to suit. By this method we not only save time but secure a perfect fit, which is not done with the lathe turned bolt. With the changes we have made on the Landis taper bolt machine it turns out the work of five lathes and is operated by only one man.

About a year ago we installed a Landis valve stem and piston grinding machine; we applied a bevel gear attachment to it to grind all guides. This stopped all filing of guides, which not only saves time but the cost of files as well and makes a much more satisfactory job. Again, we have applied to slotters, wheel lathes and boring mills a brake attachment, making them much more convenient to operate and saving time as well.

We were making packing rings on a lathe and changed from it to a boring mill; we got up a gang cut-off tool which completes a blank of nine rings at once in two hours and thirty minutes, where it used to take eight hours. We installed a horizontal miller and have applied cutters and a clamping device that allows us to finish shoes and wedges

ready for application to the engine in one operation. By showing the management the importance of purchasing a draw stroke shaper we now finish our driving box brasses ready for application in one operation, requiring thirty minutes from the time the brass is taken from the floor until it is removed from the machine ready to be pushed into the box. Formerly to do this work it took three operations requiring one hour and fifteen minutes, leaving a saving in time of forty-five minutes to each brass. Furthermore, we get a perfect fit of our brasses, resulting in better service.

The management installed in our shop an oxy-acetylene welding outfit, which has proven a wonderful labor saver. The instructor that installed it only gave us a very limited amount of information, but we have worked out the problem ourselves and are successfully welding all patches in firebox side sheets, seams, fire door collars, link work, cracks of all descriptions, etc. At first we had no end of trouble with our welds cracking, due to contraction, but we have overcome this trouble and are in a position to do any kind of work that is within the limit of the outfit. This machine has saved this company thousands of dollars.

Foremen should pay particular attention to shop tools and see that they are in good condition, see that air pipes in the shop are tight; if using oil for fuel, see that there are no leaks in the pipes and that the oil has the proper combustion in the oil furnace. The foreman should be on the alert to take advantage of every little turn to save both labor and material, keeping a good record of everything that comes under his charge and exerting every effort to improve the shop efficiency. He should see that a competent man is employed to look after all shop machinery and tools and that they are kept in good condition at all times, keeping in mind the question of working out convenient and labor saving devices, for these are the things which promote shop efficiency.

In conclusion, I would say be at all times courteous, energetic and pushing to the best advantage, endeavoring to instill into the men under your charge the importance of the greatest output at the least cost.

SECOND PRIZE ARTICLE.

BY GEORGE H. ROBERTS,
Assistant Machine Foreman of the New York, New Haven & Hartford, at Readville, Mass.

Rankine gives the mechanical definition of efficiency as: The ratio of useful work to energy expended. In the mechanical department of a railway that means: The ratio of locomotives and cars kept in service in good repair to the money expended. A good ratio can only be obtained by the co-operation of every official from the highest to the lowest. Each foreman should do his utmost toward promoting harmony in the shop, as friction weakens the organization and consequently decreases the output of the shop.

One of the first steps toward organization and harmony is for each foreman to forward an article or articles to the next foreman as soon as he has completed his work on them. This system will save time and establish a chain of work passing from one department to another. It enables each foreman to give his attention to his work in hand, as otherwise he will have to go or send to the other departments to ascertain how much material is ready for him to move to his department. In some cases there is a line of men and foremen going to and from machine and smith shops. This can all be avoided by the delivery system.

The foreman has an excellent opportunity to promote shop efficiency as he is in personal touch, or should be, with the work at all stages. He can make personal observations of the work and decide whether new or old material shall be used and the amount of labor to be performed. Possibly he can make the old go another run and thereby effect a saving and promote the efficiency of the shop, as every little saving in each department soon counts up in the shop as a whole.

The apprentice system gives the foreman another excellent opportunity to promote the shop efficiency by using the apprentices more in the sense of young mechanics and not placing them on some operation and forgetting them. They can be distributed throughout the machine, fitting and erecting shops, and a system can be established of changing them from machine to machine and from bench to floor work. In some shops the writer has noticed apprentices all in a bunch on bolt lathes and bolt cutters. This is detrimental to any shop, as the boys will be boys and are more or less inclined to play. By placing them in more important positions, such as on large lathes, boring mills, planers, etc., they will forget their boyishness and get down to business. The writer uses his apprentices on such work as rod work, machining bushings, brasses, and on eccentrics, eccentric straps, cylinder boring, cylinder bushings, etc. The younger ones are moved from the small drill, lathe, shaper, grinding machines, etc., to the heavier work. They understand that in order to "get there" they must work.

There is always a chance for improvement, and the foreman can promote efficiency by continually improving on some operation. If he is machining an article day in and day out there must be a better and cheaper way of doing it. In order to keep in touch with doings in other shops he should subscribe for one or more mechanical papers. Each shop is doing some job cheaper than some other one or possibly cheaper than any. From time to time he will find something that just solves his problems; possibly an idea that he has been trying to work out for months.

One often hears a foreman say, "I haven't time to think out such things." His organization should be such that he will have the time to study the conditions of his shop or department. Possibly he is doing some operation on a lathe or boring mill that, by making a special cutter, could be done on a drill press at a saving of from 50 to 75 per cent. The writer made a cutter with five blades to bore the large holes in exhaust pipes to hold the exhaust tips. This is now done on a drill press in 45 min. (2 holes 5 in. diameter), where formally it required 1½ hours on a boring mill. It used to require 2 hours to drill and tap eccentric straps complete (18 operations). This was cut to one hour by making a revolving jig to hold the eccentric strap. It can be revolved to all positions required to complete the drilling and tapping. We also have a sliding jig for a lathe or boring mill to bore and turn eccentrics complete with one setting, saving the time required to mount them on an arbor. Another device is an attachment on the carriage of a lathe to hold rocker boxes for boring. This can be adjusted to any height, the boring bar being carried on the centers of the lathe. This allows the use of as heavy a bar as is possible on a horizontal boring mill and boxes are bored in the same time as required on a mill. The advantage is that the box can be bored on any lathe and not interfere with the work on the mill just for one box. This could be used in the roundhouse machine shop to advantage.

The foreman should be willing to accept any suggestions from his men to improve the methods of doing the work. Oft-times very valuable suggestions are obtained in this manner.

One very important item is for the foreman to have someone trained to act in his absence. Many a foreman makes the great mistake of trying to carry the whole shop on his own shoulders. Each man should be given his own particular responsibility, as by dividing it the foreman will have the time to "think out" new schemes. A foreman should be like the general of an army and be able to stand back to take a broad view of things in general and not overburden himself with details. Then when things come to him he should take some action to improve the situation. He should have a system of checking the work and locating the weak points. If an article continually shows up behind he should take some step to improve it. The writer, to improve the piston rod

work, centers and cuts to length in the Gisholt turret lathe, doing the work in one-half the time required on an engine lathe. By making a special arrangement to hold pistons (or piston heads) on a boring mill they are finished in one setting, saving the time required to turn them over to finish the flange left by holding them in chuck jaws. They are now finished on an ordinary 36-in. boring mill in from 2 to 2½ hours. A milling cutter was made to machine the boss on a rocker arm in 30 minutes. The cutter is formed to make the large radius desired on large rocker arms.

The machine work on different articles should be done as near the fitting up gangs as possible, or if this is not possible he can move the benches nearer the machines and effect a saving in trucking back and forth. The foreman should have only enough finished castings on hand to protect himself. He derives the same protection by having two crossheads finished as six would give. If he keeps too many finished castings on hand he ties up a lot of money. When the engines are stripped the various parts should be inspected and material gotten in to replace worn or broken parts requiring renewal. Castings and forgings can be made and finished in large quantities cheaper, but if this time and material was spent directly on the engines going through the shop the efficiency would be greater, as nearly all labor and material would be directed on the engines to be repaired and put in service in as short a space of time as possible. Castings and forgings should have the engine or order number stamped in figures of white or red so the workmen can make proper distribution of the labor on the time slips.

In the machine shop opportunities to promote the shop efficiency continually present themselves in such matters as changing the finish on castings to save time in machining them. For instance, by adding more finish on the joint of the front cylinder heads the finishing of the broad face of the head could be eliminated and still the head would be just as serviceable as though it was finished all over. When such instances arise the foreman should make a sketch showing the change he recommends and give a complete description explaining what he expects to save by the change.

The machine foreman can promote his shop efficiency another way by having an inspector to examine and fill out forms showing the work necessary on motion work, etc. The inspector can caliper cylinders, crank pins, driving axles, etc., and give this information to the machine men on rod bushings, pistons, driving boxes, etc., saving much time that the machine would stand idle while the sizes were being taken by the operator. Often the wheel storage tracks will be found the entire length of the shop from the rod gang, causing a great deal of walking for the machine man on rod bushings and brasses. The same thing occurs with the piston job. Excellent results have been obtained by having these sizes taken by the inspector.

In closing will say that the foreman to promote shop efficiency is the one continually on watch to make some little improvement; each item may be small in itself but the total is considerable.

BY J. S. SHEAFE,

Mechanical Inspector of the Illinois Central at the Burnside Shops, Chicago.

The late Francis W. Cushman, member of Congress from the state of Washington, in his last address before the House, told of an early home built by his brothers and himself in the far West. It was decided that each brother, there being four, should erect one side according to his own ideas. The house, when finished, served its purpose in a way, but it was not in an ornamental way and it was necessary to do considerable work in smoothing over the rough places. It was finally decided that it would have been better had there been a master builder from the start. We will, therefore, lay aside the question of the necessity for a foreman, or general foreman, being exactly what his title indicates. From the martinet to the foreman who is satisfied for all hands to have an equal share in directing his organization is a long step; there must be the middle path which preserves discipline together with appropriate and judicious dispensation of it.

Loyalty is the grandest asset that a workman can possess and is paid the highest price. A loyal man with less skill can, for a certainty, far outstrip the better mechanic who is a grouch or who is indifferent to his work. The greatest stress should be laid upon this necessity for improved shop efficiency as it embraces all members of a shop organization from the mechanic of recognized ability to the man who sweeps the floor. How is this to be obtained? Most assuredly not by a foreman who is securely anchored within his own ego, nor by one who has no word of recognition for well directed effort. Such a one is the unsuccessful man whose output is mediocre, always has been and never will be otherwise.

That simple little word of one syllable, *tact*, so easy to recognize, yet so hard to acquire, is the secret which the big men in every walk of life have used. "Knowledge is weight, tact is momentum"; a mountain has weight and is harmless; let it move and gain momentum and there is "something doing." Just so with tact over other personal assets. It is always admitted that the first necessity is loyalty, otherwise known as system, organization, skill, equipment, or any one of a dozen different things, when a shop is known by its ability to show a high efficiency. It is the tact of the foreman that has brought about loyalty; the fact that an old fashioned shop with ancient tools in some cases has the best output when compared with other shops perfectly equipped in every way bears out this statement. The point is that the foreman with tact *will have* the loyalty of his entire force. This is every whit as reasonable as any problem in Euclid.

We now find ourselves in a poorly equipped shop, mechanically, but the human equipment is splendid, and in the shop equation the unknown quantity is always this same human equipment and the equation must be solved by the foreman to find its value, and the degree of shop efficiency attained depends upon the ability of the foreman to solve it.

Very well, watch the good mechanic! He is not content to work in all sorts of dirt, in dirty overalls, but will, in every instance, keep himself clean and his surroundings in order. Now every mechanic who is his opposite will, in general, be found to be possessed of an inferior ability, although this is not meant to infer that he cannot be brought to an understanding of his shortcomings by proper counsel. He will be the sooner educated in a desire for cleanliness if he has been tactfully handled and hence made loyal to his foreman unknown to himself. Let the foreman give him a little encouragement even if not altogether deserved. It will work wonders. Let the foreman put himself behind the cleaning up movement and then note the different air in the shop as well as the awakened actions of every man therein.

Work taken to the machine side should be kept in line and removed as soon as finished. The best man is apt to slacken his speed if he finds the "rush jobs" left for two or three days after completion and it is also certain that the pride of almost every man will spur him on a bit to increase the efficiency of his particular machine if the work, when finished, is taken at once to the place intended. In a railway shop space is always limited, therefore avoid using it for a storage place to any degree; elbow room is very necessary and should be maintained at the maximum. A clean and orderly shop will make its condition felt, and the additional operating expense for the necessary cleaning is bread cast upon the waters.

Co-operation is of vital importance. This is not to be looked upon as loyalty, but rather as the kindly relations between the various departments. A side rod or other forging is brought from the blacksmith shop with enough stock on to make two. Now comes the foreman who is tactful. The blacksmith foreman sees the error and it is remedied quietly

and with cordial relations sustained and strengthened. Is any one of us immune from the effects of words of reasonable explanation? The grand aim we have in view is "let us reason together," and not the idea of self-infallibility, such as the Quaker felt when he said to his wife, "All the world is queer but thee and me, and I sometimes think that even thee is a little off." This may seem superfluous but it is the cause preceding the effect, and the effect is shop efficiency. A man who can and does handle these little questions in such a manner that the plant as a whole approaches the close bonds of a happy family, insures better unity, and in unity there is strength; a strong shop will distance a weak one, and the race is won without any improvement in the equipment.

Modern equipment is a splendid asset but expensive. The general foreman of the right caliber is a cheaper proposition. He will take his laurels in any old shop, and his salary, in comparison with results, can not be found on the pay-roll with a magnifying glass.

There is that something in every man that is always looking for and paying tribute to class distinction. After promotion has landed a man in the foreman's position he is apt to feel that his success was not only well deserved but was very tardy in reaching him, and that it is impossible to keep a good man down; he underestimates his really dependent situation and sometimes does not see that the men under him are to make or mar his record.

Two heads are better than one. All right then! What if we have every man in the shop using his head in the interests of increased output and hence increased efficiency! Get them to think. Let them know that when they have given you a good idea, either as to a particular job, or as to some improvement in the tools or equipment, that the same idea will be passed on by you tagged with the name of the man suggesting it, and not with this important detail overlooked. The men will then commence to take a livelier interest in the shop as a whole. They have to. They cannot help it. A little present of $5 given each month to the one who has made the best suggestion for the shop starts competition. Friendly rivalry! When this exists in a shop the clock does not become tired of being stared at.

The machine side is perhaps able to show the greatest efficiency improvement, as the opportunity for losing time in the work is more easily possible. A man on the pit side must accomplish so much at any certain work or it is easily discernible by the foreman. A planer running far beyond the work on both sides is a usual occurence and is especially expensive for short work. One inch too much travel of the table each way on a 10-in. cut means a loss of 20 per cent. while the machine is running. A lathe taking two or three roughing cuts, instead of one, and other machines doing the same, and a massive drill press doing light work are particularly prevalent in railway shops and can be remedied. Here again the tactful foreman is worth many times his salary. The other fellow can remedy the case temporarily, but as soon as his back is turned the machine hand will get into his former practice and waste his energy watching for the boss.

The abuses evident in special cases can hardly be dealt with other than by the foreman in charge studying the particular case and determining upon the most feasible remedy. By abuses is meant general indifference to work, abusing the tools, washing up before the whistle blows, running the tools at low efficiency, incompetency, insubordination and so on. Most of these cases can be adjusted and remedied by careful attention to the individual. There are some men who cannot be influenced and who will never become competent or amenable to discipline. With these, after a fair tryout, there is only one thing to do, and all foremen have had experience in performing that unpleasant one thing; but, act with despatch and have it over as pleasantly as possible. One little portion of anything rancid will spoil a whole lot of wholesome product.

Intelligent discussion and "talking it over" will take away the obstacles in almost any shop. This is a good thing and should be adopted more generally than it is. A meeting of a foreman with his immediate staff is, or ought to be, an opportunity for each man to get rid of the particular idea, or ideas, which he has in his mind, and many of them will prove valuable ones. United effort always has stood and always will stand for success; a collective discussion of a shop problem spells success at the beginning.

A foreman is judged generally by the men as, "He is a prince," or "He don't know nothin'." This must indicate merely the degree of popularity and brings us again face to face with the indefinable human trait, as subtle as the undertow of a body of water; it cannot be analyzed but it appropriates every man who comes within its influence.

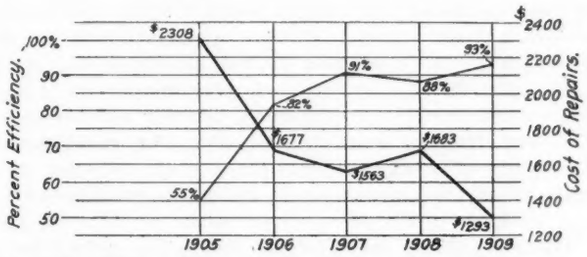
We cannot improve mankind by laying down certain directions nor can we do so by following any particular line any more than the medical profession can produce one panacea for all human ills. This is a large question and must be dealt with in a general manner. Begin and end not so much as to what a foreman can do with the facilities at hand, because they are different in every shop, but with his own improvement, individual and positive.

THE FUNDAMENTAL PRINCIPLES OF EFFICIENCY.*

BY HARRINGTON EMERSON.

It is of "efficiency" in railway operation that I wish to speak to-night, and I define "efficiency" as attaining standards of time, place and cost. In spots there is very high efficiency in the operation and maintenance of American railways, but the easily determined wastes due to preventable inefficiency still aggregate one million dollars a day; wastes that would as inevitably disappear, if properly attacked, as the inequalities revealed by a railway survey disappear when the cuts and fills are finished for any predetermined grade and curvature. It costs to build a railway with low grades and mild curves, *but as a rule it not only does not cost to attain high efficiency, but high efficiency of operation and maintenance always results in lessened costs since high efficiency means the elimination of waste.*

Costs, operation, difficulties take care of themselves the moment we forget all about them, and substitute the one ideal of "efficiency." The practical results of substituting the ideal of efficiency for worry about costs is shown in the diagram above, in which the efficiency of labor, in the same shops, with the same men, the same equipment, the same foremen, and on the same schedules was gradually increased from 55 per cent. to 93 per cent., the cost of locomotive repairs dropping over $1,000 each, yet the locomotives averaged heavier, hauled more tons and made more miles per failure. If this road had 2,000 locomotives the direct saving was over $2,000,-



	1905	1906	1907	1908	1909
Mileage per Locomotive Failure	3100	4900	4250	4641	6200
Tonnage Hauled per Locomotive Mile	685	725	765	770	796
Average Weight of Locomotives	75.63	79.50	81.74	82.98	82.98

Efficiency of Labor and Cost of Locomotive Repairs.

*From a paper read before the Railway Club of Pittsburgh, which, however, Mr. Emerson, after the presentation and discussion of the paper, has very kindly revised and amplified for our use. For instance, the original paper enumerated eight fundamental principles underlying efficiency. Mr. Emerson has enlarged upon these, increasing the number to twelve and considering each one more fully. The last five paragraphs have also been added to the original paper.

000, but in addition each locomotive hauled 3,300,000 more tons and in one year the net earnings increased $3,000 per locomotive, an additional gain of nearly $6,000,000, due to the ability to haul more freight.

One railway in the United States maintains its freight cars for $37 per annum. Another railway in similar service spends over $100. The $37 cars cost $100 less to build, weigh 6,000 lbs. less for the same capacity. At $37 on 50,000 cars there is an annual saving of $3,150,000 in maintenance cost alone below the rival figures.

Efficiency, like any other branch of applied knowledge, has its own laws. These laws are absolute. You cannot have high and continuous efficiency if any one of these laws is neglected. Wherever there is high efficiency it will inevitably be found that it is attained by observance of one or more of all these laws.

These principles are twelve in number.

(1) *Inspiration, enthusiasm*, the desire to accomplish.

(2) *Common sense*, usually flagrantly lacking in human affairs and to some extent on even the best railways.

(3) *Special Expert Advice.*—Specialists generally furnish the methods best suited to the principles as applied. The line officials use what is furnished. Few railway presidents would be competent to design a bridge, design a locomotive or freight car, design a steam engine or a dynamo, design a machine tool, or analyze tool steel or keep his own accounts. If the president needs expert advice as to all these matters, how much more does the worker at the bottom of the line need advice?

(4) *Discipline.*—Discipline means that there must be specific duties for everyone and that he must perform them. Discipline does not mean severity, harshness, arbitrariness.

(5) *The Fair Deal.*—In spite of the ten commandments, in spite of the Golden Rule, in spite of all our laws and customs, in spite of the desire of most of us to have the other man do the fair thing, the fair deal is often lacking in the relations of employer and employee, of corporation and client or customer.

(6) *Definite and Specific Standard Practice Instructions.*—As to some matters—time tables and rules for train employees—these are very minute and exact; as to other matters wholly lacking. Most of the best shop practices are carried around under one's hat and are not reduced to writing.

(7) *Reliable, Immediate and Adequate Efficiency Records.*—These include cost distribution. Proper records give positive and incontrovertible knowledge. In usual operations nine-tenths of what goes on is guess work. Most of us would make the wildest guesses about the opertions of his own body, and we know less about our own work.

(8) *Scheduling and Despatching.*—The principles of a train time table and control of train movement by despatchers can be and should be applied to shop and other maintenance operations.

(9) *Time study work* gives the necessary facts for proper schedules and despatching. Time study is a principle, not a method. There are many different methods just as there are many methods of determining a quantity of wheat—weight, measure, estimate, guess, counting the grains, etc.; that method is preferable which gives the greatest amount of accuracy in the shortest time and with the least trouble.

(10) *Standardized Conditions.*—You give the locomotive engineer both a locomotive and a clear track; you give him water tanks and coal chutes; you give him a set of signals. You rely far more on the conditions than you do on the man. The Pennsylvania Railroad has more engineers than it has engines capable of pulling the 18-hour train. When conditions are standardized it is not difficult to find men.

(11) *Standardized Operation.*—When conditions are standardized it is easy to realize standard operation. It is an easier task to run the 18-hour train on time than to run a local freight. The more conditions are standardized the more we can demand a standard operation.

(12) *Efficiency Reward.*—Efficiency reward is a principle. It is one of the fundamental laws of the universe. The most efficient in some line or other obtain the biggest rewards. The most efficient have survived, the inefficient have perished. Every worker, from president down, ought to be compensated, partly at least, on the basis of his efficiency.

The particular form of efficiency reward is not a principle, but a method. In France they reward a lifetime of efficiency by a button of the Legion of Honor, which entitles a man to a military funeral. In England they give him a title, in China they bonus his ancestors, in this country he pulls down the money. The so-called bonus method is a definite increase of wages based on a definite and measurable increase of average efficiency. High efficiency is impossible for either man, gang or shop until many of the other principles have been recognized and made effective; therefore, a bonus is the last—not the first—thing to be offered. Upright and conscientious management, including foremen, good tools, proper work and health conditions precede bonus.

When I am given the privilege of examining the organization and operation of a large plant, it is not the details that interest me. The men about the plant are far more competent than I am to give an opinion as to details. I look for evidences of lack of common sense, for lack of discipline, for unfair conditions, for inadequate records, for unstandardized conditions, for unstandardized operations, and I base my estimate of preventable wastes on the observance of principles, not of details. It is not the system, the particular form of blank, that counts. It is the ideal behind any and all system that counts.

The methods used to determine losses are so positive, so absolute, so indisputable and so simple, that any competent committee of qualified experts could verify the conclusions, and the name of any one of fifty railways could be drawn by lot and a similar investigation would show that it was contributing its quota to the loss of one million dollars a day. Do not imagine that I, an outsider, am slandering a great business of which I know nothing. I have been intimately associated with railway planning and maintenance for nearly thirty years. I have also learned intimately about other businesses, and the losses complained of are universal and inevitable under our present methods of inadequate check.

Railway management is not worse than the average; it is, on the contrary, in many respects better. The railways of the United States, as to special operations, set up and realize as high standards as the world has ever seen. The 18-hour trains between New York and Chicago, the fastest and longest run high speed trains in the world, maintain a standard of promptness of 99.96 per cent. A man living on the line could set his clock by these trains. Here is a case of: (a) Reliable records. (b) Standardized conditions. (c) Standardized performance. (d) Continuously attained.

In the accounting department standards are equally high. Not a cent is spent untraced, or without authority. Here also: (a) There are abundant records. (b) Standard methods of bookkeeping. (c) Specialized for the operation. (d) Balances have to be made.

The whole auditing and accounting is in the hands of specialists who take their inspiration not from the board of directors, not from the executive officers, but from standards that are not only older than railroading, but which antedate the discovery of America.

Standardized conditions in railway operation have already been referred to. Among the most important of these are track and way. No higher standards are conceived, created and maintained than the track, way and bridges of a first-class American road. Here again there are: (a) Records, not always adequate. (b) Standards of construction. (c)

Standard realization. (d) The work being conceived and put into effect by specialists, engineers.

Enough to show that in these respects and many others American railways set up and realize high standards, and to justify what I am about to say as to absence in much of railway operation of: (a) Adequate and reliable records. (b) Standardized conditions. (c) Standards of performance. (d) Definite responsibility and reward. (e) Competent specialists.

Usually the man who best executes is not always the best man to create proper conditions, and the best creator is not always the best doer. A locomotive engineer, even though he takes the 18-hour train over his division in perfect manner every day, neither created the track, the locomotive, the despatching or the signal system, but, on the other hand, the inventors and improvers of these matters were never fitted for locomotive engineers. Let it not, therefore, be supposed that I am in any way criticizing the great operating contingent in American railways. They do what they can, and no higher body of men exists. My criticism of results is based, not on the inefficiency of the men, but on the: (a) Inadequate records. (b) Inadequate and inferior conditions. (c) Inadequate special skill.

To illustrate what I mean: There is no railway east of the Rocky Mountains in which locomotives ought not to be maintained in first-class operating condition for five cents per locomotive mile. I go further, and believe four cents is an ideal to be striven for and ultimately reached. This does not mean that if a railway only had two locomotives, and they collided, the maintenance expense that year would not exceed five cents; it does not mean that if there were so little business that each locomotive only made 10,000 miles in a year, five cents could be realized; it does not mean that every locomotive or every division will come down to five cents, or that any locomotive on some divisions will come down to this figure. It does mean that any railway with 10,000,000 miles a year of mixed freight and passenger service ought to maintain its power for $500,000.

We actually find, however, astonishing variations for similar operations. Comparing the locomotive maintenance costs of five trunk lines operating between the same terminals between 400 and 500 miles apart, under largely similar conditions, in round figures, it costs:

Road A— 6 cents a mile.
Road B— 8 cents a mile.
Road C—10 cents a mile.
Road D—12 cents a mile.
Road E—16 cents a mile.

Assuming 30,000,000 locomotive miles a year, and a $0.06 a mile standard:

Road A wastes nothing.
Road B wastes $600,000.
Road C wastes $1,200,000.
Road D wastes $1,800,000.
Road E wastes $3,000,000.

My assistants and myself have been in the shops of all these companies, and, as to a large part of the loss, we know, in part, why and where it occurs. If, as to every minute operation, there were a standard and a record, showing actual cost compared with standard cost, it would be easy for every man, every foreman, every superintendent, to check what was going wrong. Many railway records are not available for six weeks after the fact has occurred, and as to many facts, not available for more than a year. It has been my experience that if you give a fireman a water-glass and a gauge, he will watch them, and make a strong effort to maintain standards; and it has also been my experience that if standards are supplied to shop and track men and if records are available from hour to hour, a strong effort will be made to attain and maintain standards, and that it is just as easy to maintain a shop or roundhouse efficiency of 99.96 per cent. as it is to maintain this efficiency in a train schedule.

In a very large locomotive shop conditions were first standardized, and then standards of performance were furnished. The shop went on as before, same equipment, same work, same men, same foremen and other officials, but standards as to his own particular duties were set up for every man.

The results were as follows:

Month.	No. of men.	Hours Standard	Hours Actual.	Efficiency.
1st	21	2,011.2	3,613.9	55.6
2d	50	4,350.2	7,418.8	58.6
3d	77	7,649.6	12,748	60.0
7th	251	27,051.8	41,463	89.3
12th	656	122,736.4	126,534.4	97.0
13th	731	120,357.5	120,478	99.9
14th	771	148,841	146,434	101.7
15th	819	155,276.5	160,701	96.5

The 819 men have by no means reached the highest efficiency, as is shown by the table of classification below, averages wages assumed at $0.30 an hour and working hours at 250 in the month:

Workers.	Average efficiency, per cent.	Wages.	Bonus, per cent.	Bonus.
61	30.3	$4,575	.....	.....
33	45.0	2,475	.....	.....
50	55.8	3,750	.....	.....
72	64.6	5,400	.....	.....
216				
81	74.2	$6,075	1.1	$66.82
76	84.3	5,472	5.8	317.37
74	95.0	5,500	15.0	825.00
90	105.9	6,750	25.9	1,748.25
94	114.6	7,050	34.6	2,439.30
64	123.9	4,800	43.9	2,107.20
56	132.4	4,200	52.4	2,200.80
26	145.3	1,950	65.3	1,271.35
19	154.1	1,425	74.1	1,055.95
6	163.3	450	83.3	374.85
17	196.4	1,275	116.4	148.40
603		$61,147		$12,555.29

Total wages	$61,147.00
Total bonus	12,555.29
Average bonus per cent. to bonus workers	27.9%
Average bonus to all workers	20.5%

If 603 men out of 819 earn bonus it is evident that the schedules are not severe.

In a particular gang of 32 men, an average efficiency of 95.8 per cent. was attained, standard time being 7.211.6 hours, actual hours 7.523.5. The highest man showed 139.2 per cent. efficiency, the lowest 7.8 per cent. These men were on the same kind of work, under the same foreman. Each man was receiving the same rate of wages. In the name of commonsense and justice, what are you going to do with such conditions? Bury your head in the sand like an ostrich and pretend that these differences do not exist? Object, as some of the union officials do, to any records or checks that show up these differences? Assuming the cost per hour of operation being $0.30 for wages, $0.30 for machine charge and $0.25 for overhead expenses on the man, we have an hourly average operating cost of $0.85 an hour. The man and machine work 250 hours in the month at a cost to the company of $212.50.

The table shows how the cost of work per hour varies as efficiency varies:

Efficiency, per cent.	Hours Worked.	Hours Standard.	Cost, per mo.	Cost. standard hour.	Relative costs.
60	250	150	$212.50	$1.42	167
100	250	250	212.50	.85	100
140	250	350	212.50	.61	72
8	250	20	212.50	10.62	1,248

This is an actual record—not an imaginary one—taken from a railway shop.

Are you going to pay full wages to the man who only delivers one-twelfth of a fair day's work?

Are you going to allow work to cost $10.62 that ought to be done for $0.85?

Are you going to pay the same wages to the man who does, in the same month, seventeen and a half times as much work as some other man?

Are you going to pay the same wages to the man who makes a given job cost $0.61 as to the man who makes the same job cost $10.62?

Everyone of the twelve fundamental principles are violated when such evils are not remedied.

Shop Kinks.

FROM THE ELIZABETHPORT SHOPS OF THE CENTRAL RAILROAD OF NEW JERSEY.

SHOE AND WEDGE CHUCK.

The half-tone illustration, Fig. 1, shows a small planer which handles the finishing of shoes and wedges. The chuck shown upon the bed and in the drawing, Fig. 2, is of a design which differs from any yet illustrated. One flange of the shoe

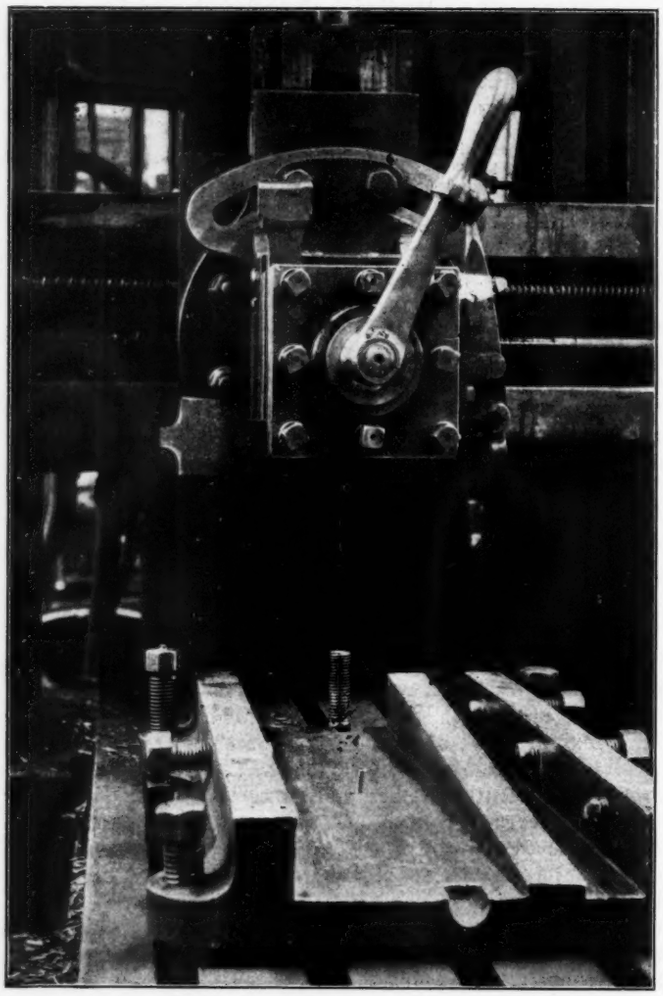


Fig. 1—Shoe and Wedge Chuck on Small Planer.

or wedge is placed between the set screw points and the cast partition of the chuck, against which it is clamped by the set screws. Reference to the drawing, Fig. 2, shows a part circular plate and a long tapered key. The slot in the plate engages the pin in the bottom of the chuck. This plate and wedge hold the other flange against the single set screw on the left-hand side of the chucks.

The adjustments for height to get the pop marks in position are gotten by the four vertical corner screws, which adjust the entire chuck.

A turret tool holder is used on this machine. It is capable of holding four tools, one for roughing, one for finishing and two for the fillets, only three of which are shown.

PACKING RING TOOL.

The drawing, Fig. 3, shows a tool for use on a lathe for finishing up Dunbar cylinder packing rings. The sliding tool post provides for setting the tool to finish a number of rings to a given size and in case of the tool's cutting edge wearing, it is only necessary to readjust the tool. The steel guide pin receives the side thrust of the packing ring, and, if desired, both sides of the ring may be machined at the same time by replacing this guide pin by a cutting tool. The work for which this tool was designed was formerly

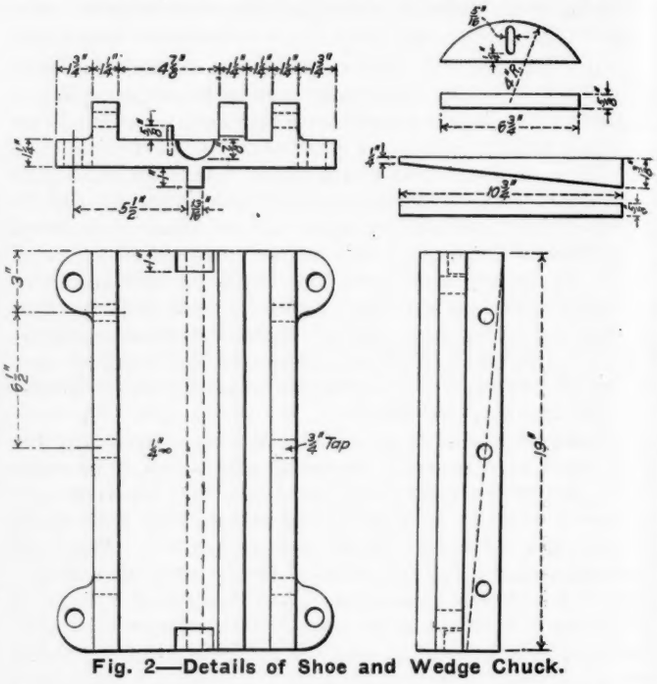


Fig. 2—Details of Shoe and Wedge Chuck.

done with a forked tool, through the ends of which steel cutters were driven on an angle, and held by set screws. It

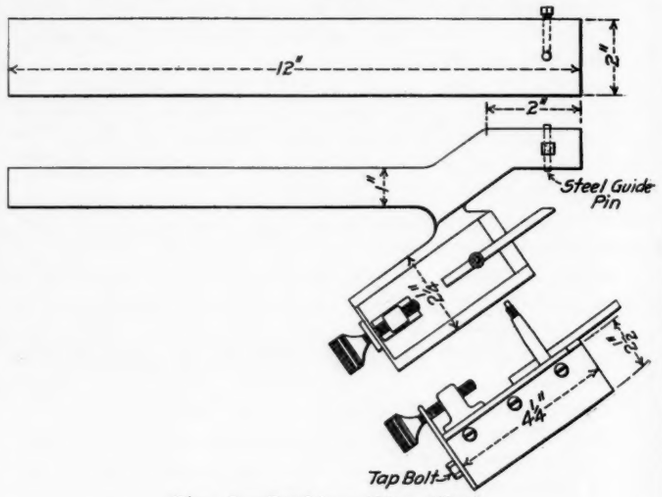


Fig. 3—Packing Ring Tool.

was difficult, however, to get the fine adjustment of the cutting edges, which fact is emphasized in the tool shown.

FROM THE SHOPS OF THE EASTERN RAILWAY OF FRANCE.

DEVICE FOR BORING HOLLOW SPHERES.

A handy device for boring hollow spheres, and one which is in use in a French machine shop, is shown in Fig. 4. In the drawing the piece to be turned is shown in section, and is carried by a chuck or hollow spindle of lathe. The tool is carried by a worm gear, supported by a bar held in the tool post. The spindle and worm operate the feed and are turned by a handle. For adjusting, the tool is turned so that the center of the gear coincides with the axis of the lathe spindle. If the center line corresponds with that of the piece, it is fed directly into the work until the center of the worm gear coincides with the center of the surface with the turn. When

this is done, the tool is fed through the circumference by turning the hand wheel. With this device, the internal surface of a sphere can be bored through any number of degrees, provided there is an opening of sufficient size on one side to admit the tool. The radius of the surface so turned is equal to the distance from the point of the tool to the center of the

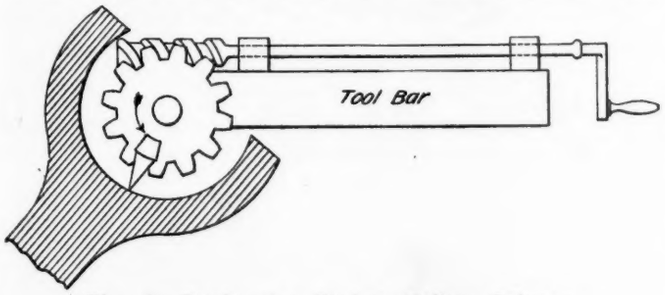


Fig. 4—Device for Boring Hollow Spheres.

worm gear and can only be varied by readjusting the tool A study of the design will show that it is not necessary to adjust the spindle so that the center line coincides with that of the lathe spindle, although in this position the greatest radius of turning can be obtained.

DEVICES FOR GENERAL SHOP USE.

BOILER OR TANK JACKS.

Where small shells or boilers are handled, such as the main reservoirs of locomotives, it will be found convenient to have jacks with adjustable heights. Two of these are shown in Fig. 5. The stem of the jack is threaded to fit the nut in the stand, which nut operates to raise or lower the jack. Where

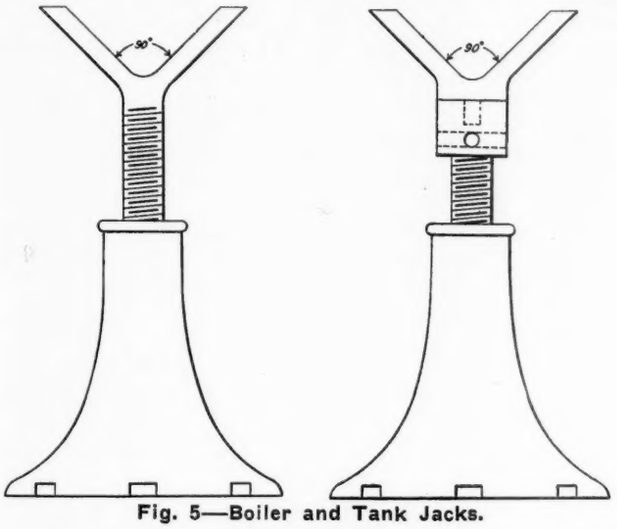


Fig. 5—Boiler and Tank Jacks.

the arrangement is to be used for hoisting main reservoirs into place, the Y-shaped head is made separate and has a small stem that drops down into the head of the screw, as shown by the dotted lines in the drawing. With this jack, a reservoir may be raised and held in position while the fastenings are being adjusted.

PISTON ROD EXTRACTOR.

A piston rod extractor, which was designed some years ago and has performed good service, is shown in Fig. 6. Two straps, A, A, are set over the piston rod and the apparatus respectively, and are held in position by the bolts B. The apparatus consists of a cylinder C, in which there is a piston, the stem D of which projects and is brought to a bearing against the end of the piston rod. The strap prevents the cylinder from backing off when pressure is applied. The projecting end of the cylinder at E is fitted with a coarsely threaded screw F, whose head receives a turning bar through a drilled hole. The end of the screw works through a leather packing, the space between it and the piston being filled with white lead, which acts as a pressure medium. In using, the device is adjusted so that the stem of the plunger bears against the piston rod, after which the screw is run in. This displaces the white lead, the thrust of the screw being multiplied in proportion to the square of its diameter to that of the piston.

PISTON RINGS.

The most economical point of cut-off in a steam engine lies back of the half stroke—and with the increasing temperatures and pressures of modern practice it is getting further back each decade. [Experiments involving higher steam pressures than 140 lbs. go to show that the most economical cut-off for all speeds, of the experimental locomotive, is somewhere between one-quarter and one-third stroke.—W. F. M. Goss, in Locomotive Performance, 1907.] Piston rings will ever be a

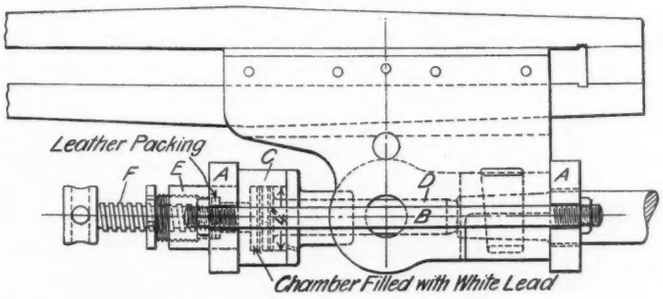


Fig. 6—Piston Rod Extractor.

necessity, as engine cylinder bores will tend to wear hour glassing. Where a cylinder is "hour-glassed" or, what is more rare, "barreled," in longitudinal section, set out rings are scarcely to be considered and steam-packed or ordinary spring rings will be most popular.

While piston rings have any freedom of motion radially, there will be rattling and other noises caused by them, especially through neglect. There are several causes for this condition.

The first perhaps is a too long or too short stroke or unevenly adjusted piston, so that at one or both ends the rings either overrun or underrun the counterbore. Where the ring overruns, as shown in the left-hand drawing in Fig. 7, then the steam, particularly if there be lead, strikes the outer surface of the ring compressing it until it re-enters the cylinder bore. These alternate contractions and expansions of the rings at each end of the stroke often cause a noise. If the trouble occurs at only one end of the cylinder (usually due to improper adjustment of crank and wrist-pin brasses) it may often be remedied by setting out the brasses so that the rings will not override the counterbore at either end. This bad adjustment is mostly likely to occur when the brasses are so arranged that tightening at the wrist-pin end of the connecting rod lengthens it, and tightening at the crank pin end shortens it or vice versa.

When a case of faulty design, the ring should be turned smaller by the amount of the overrun, and the groove will then have to be lined-up accordingly. Where the ring does not reach the counter-bore there is apt to be shouldering for a width equal to the underrunning. The gouging out of the bore up to the edge of the shoulder and the striking of the ring against this shoulder makes the noise. Where the shoulder takes place at one end only and the piston overruns at the other, the stroke should be equalized. When there are shoulders at both ends, either the piston-head or the follower should be turned out and new rings put in (which is seldom possible or advisable) or the counter-bore should be lengthened so as to include the length of the shoulder.

Another cause of piston rings slamming is due to water behind the rings. Where steam enters it condenses and the motion of the rings against this water makes a good deal of noise. A steam-tight lap ring to cover the main ring joint will stop the trouble, nad where this is practicable, the ring should be revolved—in a horizontal engine—so as to bring the joint at the bottom. The ring or rings should be pinned to the piston to allow the water to leak out at the bottom.

Where this cannot be done, small holes should be drilled to free the water.

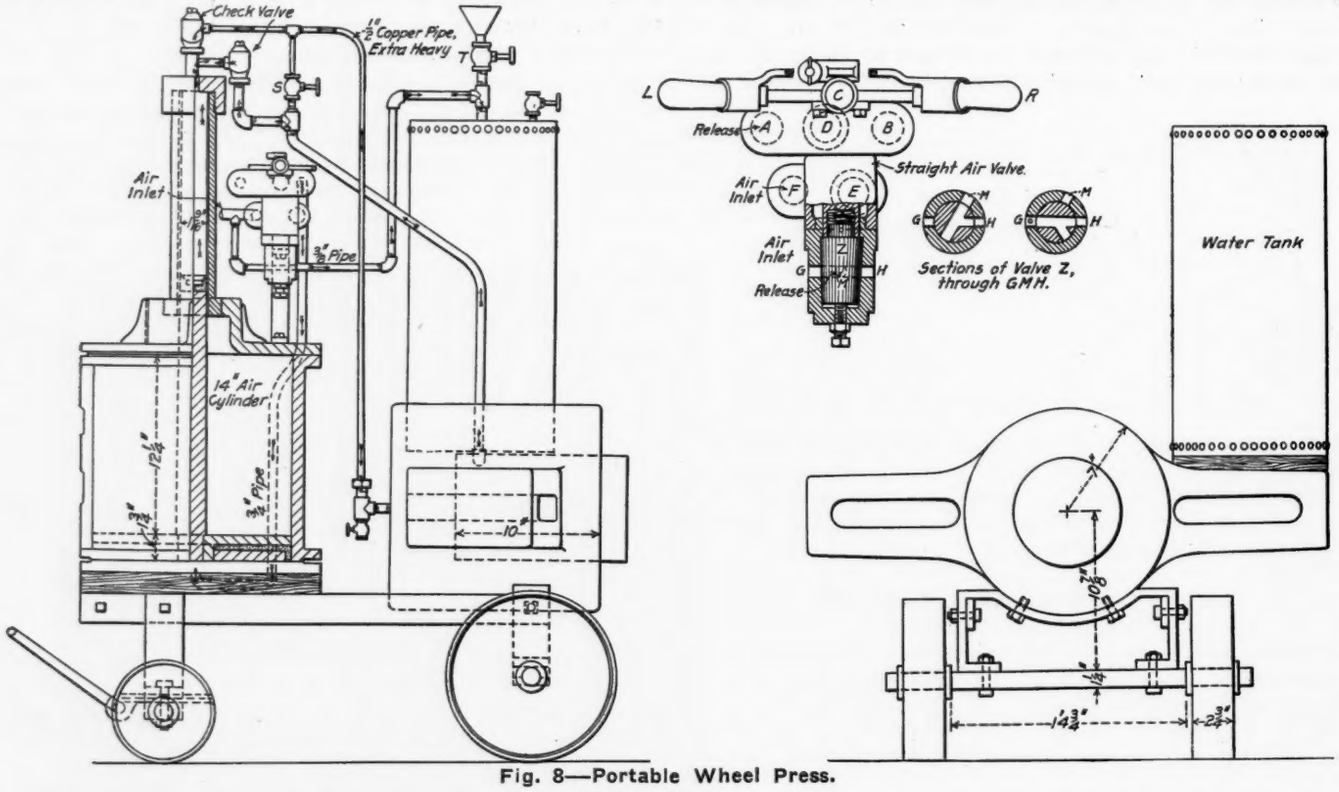


Fig. 8—Portable Wheel Press.

It often happens that a spring ring proves to be a trifle loose, and this may be overcome by drilling small holes so that steam pressure will set them out. If these holes come above the rod, then the water of condensation cannot get out, and if drilled below the rod it is more satisfactory. If the rings slam a great deal and the steam consumption increases at the same time under the same load, it is a sign of a broken ring, and the engine should be shut down at once.

Some builders make spring rings with the outer and inner circles concentric, while others turn them eccentric and make the cut in the thin side. This gives the best results after the correct eccentricity of the inner and outer diameter is found. There are likely to be a few cut cylinder-bores during the experiments of obtaining, by this means, equal pressure all around the piston circumference.

PORTABLE WHEEL PRESS.

The drawing, Fig. 8, shows a portable combined pneumatic and hydraulic wheel press with capacity up to 190 tons. It is mounted on a 4-wheel truck so that it can be used in the roundhouse or in any part of the shop. The ordinary work of pressing a wheel on the axle is accomplished with this machine in three minutes. It was designed by John Horne, draftsman of the Chicago, Burlington & Quincy shops at St. Joseph, Mo. The 14-in. piston in the air cylinder operates a $1\frac{9}{16}$-in. hydraulic plunger, which forces water into the ram in the press. The air cylinder is operated by a valve, shown in section, and the connections of the various parts are explained as follows:

When the handle is in the center, air is cut off. The handle in position R opens valve E and closes valve D, making connection to the 14-in. air cylinder through F E B, as shown by arrows, also closing air inlet in valve Z at G and making connection through H and M to the atmosphere, as shown on section of valve Z at G M H, raising the 14-in. air piston and the $1\frac{9}{16}$-in. water piston, forcing water into the ram. The handle in position L closes valve E and opens valve D, making connection B D A from the 14-in. air cylinder to the atmosphere; also opening the air connection on valve Z through G H, as shown on the section of valve Z, to the top of the water tank, forcing water through the pipe at the bottom of the tank to the top of the $1\frac{9}{16}$-in. piston, forcing the piston down and filling it with water ready for another stroke. Each stroke moves the ram ¾ in. To force the ram back, put the handle in the center and open globe valves S T.

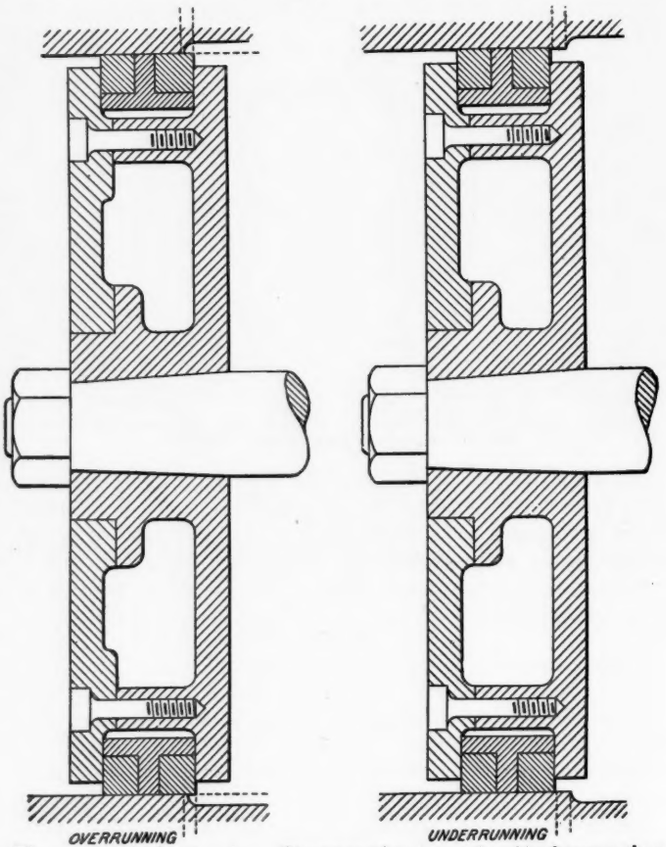


Fig. 7—Pistons in Overrunning and Underrunning Positions.

CAR REPAIR SHOP NOTES FROM THE ERIE RAILROAD AT BUFFALO.

BY ROY V. WRIGHT,

Mechanical Department Editor of the *Railway Age Gazette.*

The car repair plant of the Erie Railroad at Buffalo is the largest one on that system. It is the most important point for passenger car repairs, heavy repairs having been made to 55 such cars during the month of March. In addition, seventy 70,000-lb. capacity twin hopper coal cars were rebuilt and equipped with steel underframes, five new cabooses were built, and heavy repairs were made to more than 100 freight cars,

Fig. 1—Steel Center Sill Cut with Oxy-Acetylene.

many of them of all-steel or steel underframe construction. Very few light repairs are made at this plant.

The shops are very old, but the force is well organized and probably turns out its work as efficiently and economically as any other car repair shop in the district. Over 725 men are employed at the present time. Based on the total pay-roll, including supervision, 86 per cent. of the force is working piecework. This is probably as high an average as it is possible to obtain on this basis.

Both the shops and the car repair yards in the vicinity of Buffalo are under the jurisdiction of R. Gunn, superintendent of car shops. J. McKenna is the general foreman at the Buffalo shops. We are indebted to T. Rumney, general mechanical superintendent, E. A. Westcott, superintendent car department; to the above named gentlemen, and to the various department foremen for courtesies extended in connection with the gathering of data for this article.

OXY-ACETYLENE FOR STEEL CAR REPAIRS.

In looking over the plant in search of labor and time saving methods and devices the most striking feature encountered was the use of oxy-acetylene cutting apparatus in connection with the repairs to steel cars and the cutting off of the rivets connecting the coupler and coupler yoke. As far as we have been able to find, this is the first place where the oxy-acetylene apparatus has been used for steel car repairs, if indeed it is not the only place where it is used for this purpose at the present time. The results that are being gained from its use are so important that it will undoubtedly soon be used extensively at points where considerable repairs are made to either steel or steel underframe cars.

The center sills on hopper and gondola cars, especially the older equipment, are often cracked or broken near the bolster, and it is necessary to cut the sill off and splice on a new end. In doing this the practice on most roads is to drill a number of holes in the sill with a pneumatic drill and cut it off with a pneumatic chipping hammer. This is a rather difficult task, as it is hard to set the brace, or "old man," for the air drill, and after the holes are drilled it is not an easy matter to cut the sill, as the workman must work in an awkward position. With the portable oxy-acetylene apparatus it is a comparatively simple matter to cut the sill. The apparatus is placed alongside the car, and the operator can easily go under the car and direct the flame on a chalk mark showing where the sill is to be cut. A center sill cut in this

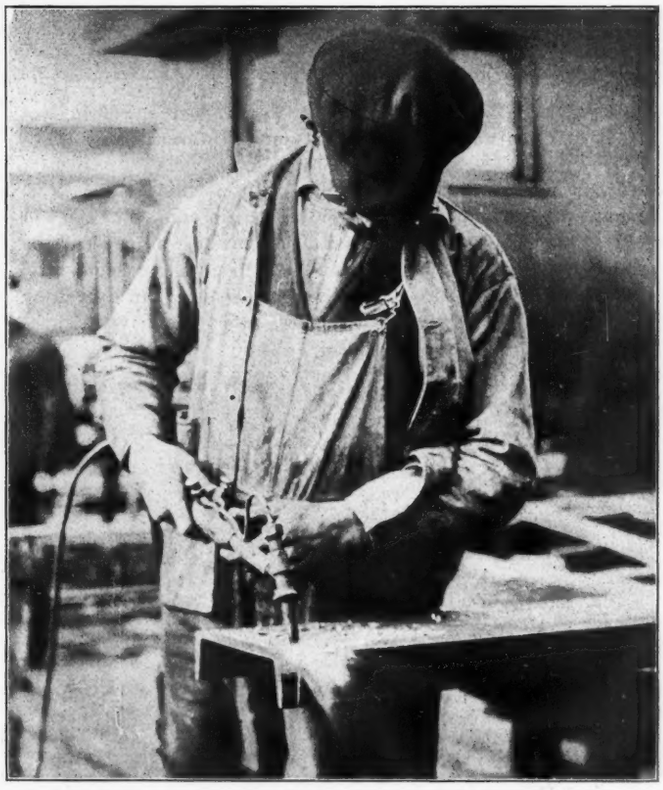


Fig. 2—Cutting a Steel Channel with an Oxy-Acetylene Torch.

manner is shown in Fig. 1. It was practically impossible to take a photograph while this operation was being performed, but the way in which the operator handles the torch is plainly shown in Fig. 2. A 12-in. or 14-in. channel, such as used for center sills, can be cut through in from two to two and a half minutes, at a cost, including labor and material, of about one-sixth of what it would be by the method formerly employed and described above. This cost, however, presupposes that the oxy-acetylene apparatus is in more or less constant use and does not have to be specially prepared for each opera-

tion. Where it is only used occasionally the expense would, of course, be higher.

Even after the center sill is cut, where the car is equipped with a built-up bolster, the most difficult part of the job remains, and that is cutting the rivets which connect the center sill to the bolster. These rivets are difficult to get at and it is

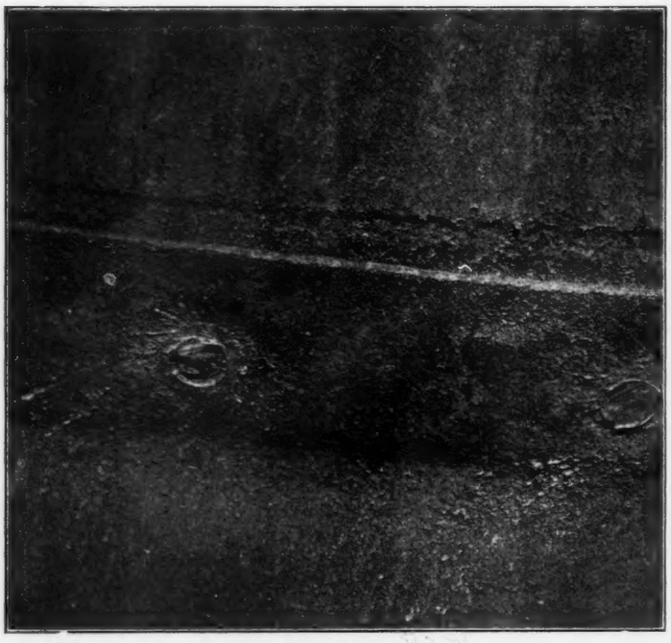


Fig. 3—Rivet Heads Are Cut Off Flush, but Plate Is Not Injured by Oxy-Acetylene Flame.

a tedious job to remove them by ordinary methods. With the oxy-acetylene apparatus the rivet heads can easily be cut off in a very short time. At first thought it would seem impossible to cut off the rivet by melting through the head without injuring the sheet, but that it may be done without doing so is indicated by Fig. 3, which shows two 5/8-in. rivets whose heads have been cut off. The molten metal, which is blown to one side by the force of the flame, has adhered to the sheet as shown, but the sheet itself is not touched.

Fig. 4—Cutting Off Rivet Heads on End of Steel Car.

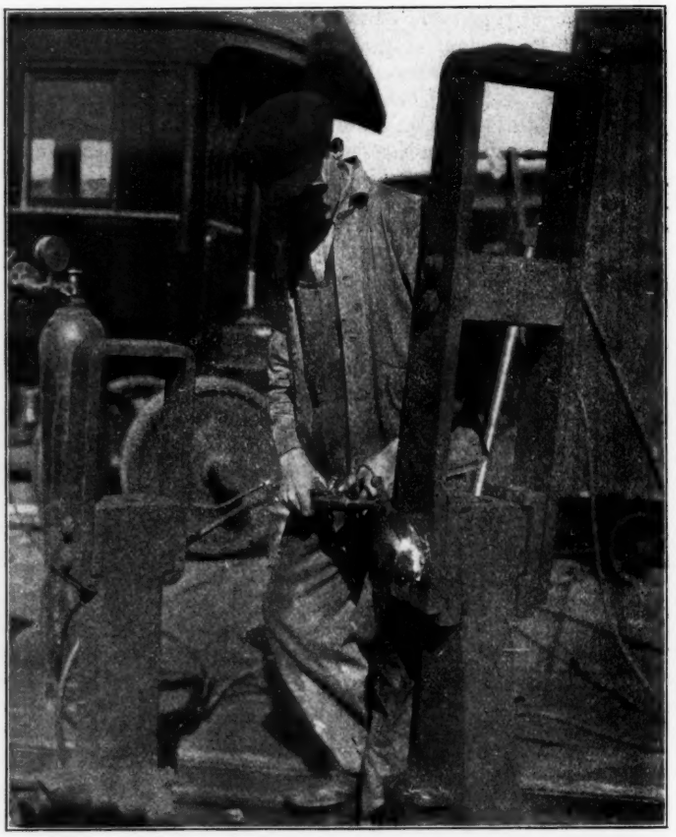


Fig. 5—Cutting off Rivet Head on Coupler Yoke with Oxy-Acetylene Torch.

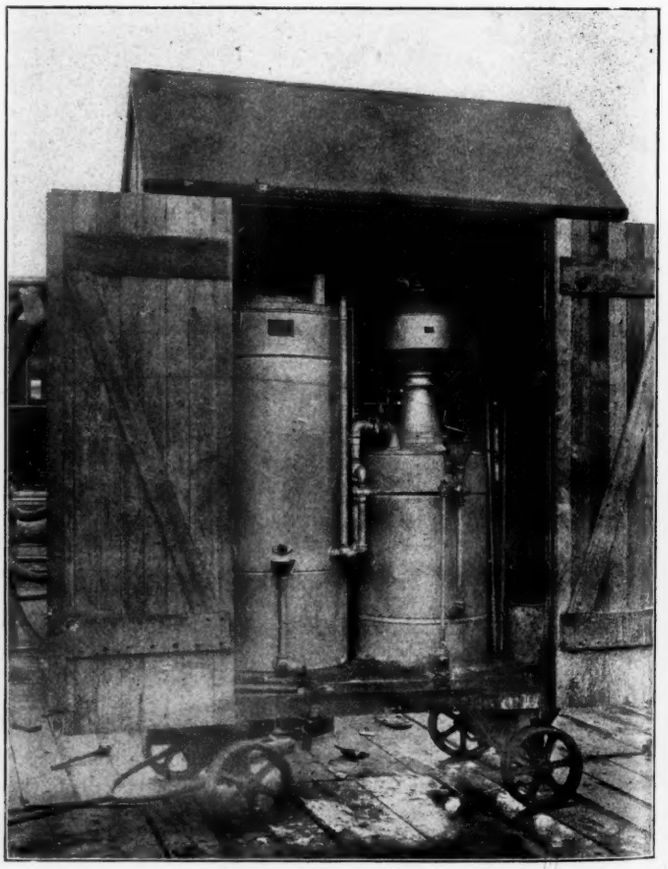


Fig. 6—Acetylene Generator Mounted on a Truck.

In Fig. 4 the operator is shown cutting off a rivet head on the end of a steel car. It is probably as quick and as cheap to cut off such rivets with a cold chisel and sledge as to do it with oxy-acetylene, and these rivets are usually cut off in that way unless the oxy-acetylene apparatus happens to be handy. However, the chisel bar method requires two men as against one with the cutting apparatus, and there is no danger of flying rivet heads injuring passersby with the latter method.

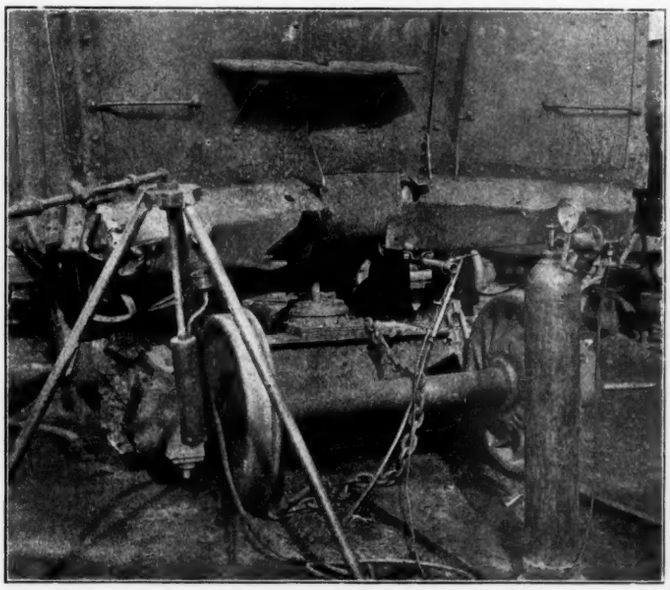


Fig. 7—Oxygen Tank, Torch, Etc., Used with Oxy-Acetylene Cutting Apparatus.

Unknown to the operator, the writer timed him while he was cutting off five of the rivet heads. It took less than two minutes.

The easy and cheap removal of coupler yokes from damaged couplers has been a difficult problem to solve. Many devices have been designed for this purpose, but some of them have

Fig. 8—Heating a Steel Center Sill with Crude Oil Burner.

gone to the scrap heap and a large percentage of the remaining ones are not giving the best of satisfaction. From the results that are being gained at the Buffalo shops it would appear that the oxy-acetylene apparatus offers a most satisfactory solution to the problem. To illustrate its adaptability

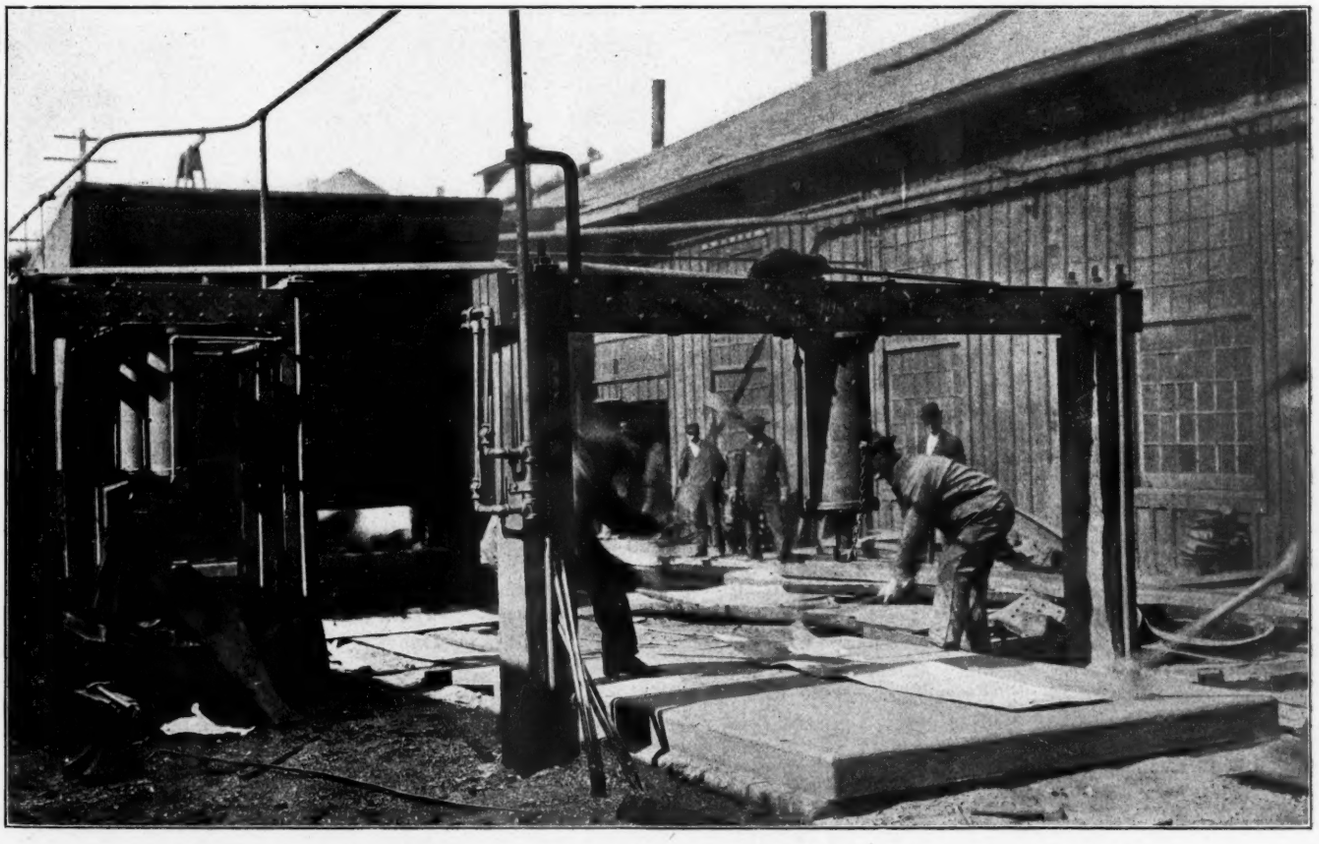


Fig. 9—Furnace and Face Plate for Heating and Straightening Large Steel Car Parts.

for this purpose a little demonstration was made. Three couplers were stood on their heads. The rivet heads on the first yoke were very large and square (Fig. 5) and it required 1¼ minutes for cutting off each head. On the other two yokes they were of the ordinary size for a 1⅛-in. rivet and required an average time of only five-eighths of a minute per rivet. The six rivet heads on the three coupler yokes were thus cut off by one man in five minutes.

A general view of that part of the machine that is used for generating the acetylene, and which is carried on a truck, is shown in Fig. 6. It is a comparatively simple matter to charge this generator. It was designed for stationary use but was placed on a truck by the railway company to make it portable. The manufacturer now makes a portable outfit which is more conveniently and compactly arranged. The rest of the apparatus is shown in Fig. 7. The vessel or tube, which is supported by the tripod, is filled with water and the acetylene gas passes through it; all danger of air backing up into the generator or of back fire is thus eliminated. The oxygen is contained in small tanks, as shown at the right. These tanks are filled by the manufacturer and contain 100 cu. ft. of oxygen under 1,800 lbs. pressure per square inch. The oxygen is mixed with the acetylene and ignited, the burner for this purpose being shown in the illustration. This particular apparatus was furnished by the Linde Air Products Co., of Buffalo.

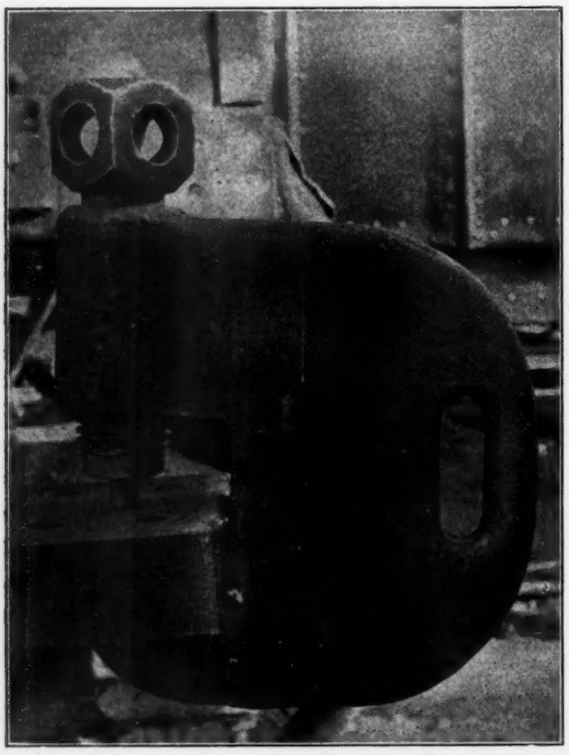


Fig. 10—Portable Punch for Light Work.

REPAIRING PARTS OF STEEL CARS IN PLACE.

It is quite often possible to straighten or repair damaged parts of steel cars in place. For this purpose a Ferguson portable heater and kindler is used. The flame from such a burner playing on the center sill of a steel underframe is shown in Fig. 8. Where it is necessary to heat the bottom of a member of a steel underframe on a wooden car the oil burner cannot be used, because of the danger of igniting the wood. For such purposes a small size of open top rivet heating forge may be used to advantage.

STRAIGHTENING PRESS FOR DAMAGED STEEL PARTS.

At one end of that portion of the yard which is used for repairing steel cars is a large oil furnace for heating the damaged parts, and an iron face plate and press for straightening them. This is shown in Fig. 9. The furnace was furnished by the Railway Materials Co. and is 8 ft. 10 in. wide, 20 in. high and 13 ft. 11 in. deep inside. It has an opening at the far end 15 in. high and 45 in. wide, making it possible to pass the end of a long sill or other piece of material through the furnace, so that it may be heated in the middle or at any other part. One of the burners is purposely lowered for heating parts locally. The house or hood was built over the furnace to protect it from the weather.

The iron face plate upon which the parts are straightened is 7 ft. wide, 10 ft. long and 6 in. thick. Most of the parts are straightened, after they are properly heated, by two or three men using sledge hammers. In some instances it is quicker to admit air to the cylinder, which is supported by the frame work, and clamp down one end of the piece on the face plate while the men drive down and straighten the other end. The air cylinder is about 8 in. in diameter.

To the left in Fig. 9 is shown another press, having two 8-in. air cylinders, which are controlled by one valve and operate simultaneously. This was intended for pressing out such parts as side stakes, using special dies. There is not much of this work to be done, however, and it is only used occasionally.

CRUDE OIL STORAGE.

Crude oil for use in the above mentioned oil furnace and for the furnaces in the blacksmith shop is stored in two 6,000,-

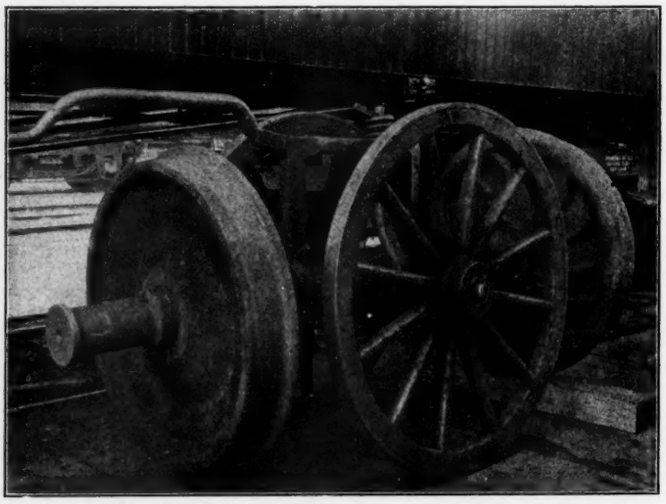


Fig. 11—Truck for Transporting Mounted Wheels.

gal. tanks, which are placed in a pit below the ground level. This is covered over with timbers. The oil is unloaded into these tanks from the cars by gravity and is forced from them to the furnaces by admitting air to the tanks under a pressure of 15 lbs. per sq. in.

PORTABLE PUNCH FOR LIGHT WORK.

It is often necessary to drill a ⅝-in. or ¾-in. hole in steel plates on trucks or car bodies when an air drill is not available or too much time would be required for setting it up. In such cases the small punch shown in Fig. 10 is of value. It will punch ⅝-in. or ¾-in. holes in plates up to ⅜-in. or ½-in. in thickness. The jaw opening is 2¾ in. wide, and the reach from the center of the punch is 2⅝ in. The screw is 2¼ in. in diameter.

PULL-IN CLAMPS.

In repairing and reinforcing the sides of gondola or hopper cars it is often necessary to pull them in to the proper position. To do this a clamp has been made with a turnbuckle, 28 in. long over all, at the center. The 1¾-in. rods which fit in the turnbuckle are upset at their outer ends to form a hook 4 in. wide and 1¼ in. thick in section.

LIFE OF STEEL CARS.

Although the Erie Railroad has many steel cars which have been in service for 12 or 14 years, no serious trouble has been had from deterioration due to rust or corrosion. It is to be expected that floor sheets which have been in service for such a length of time may need renewing when the car is so badly damaged that these sheets must be removed and be heated in the furnace. The loss in thickness, due to rust and corrosion, and also scaling due to the heating, sometimes makes them too thin to warrant replacing them on the car. It has been observed that the steel deteriorates less rapidly when the cars are kept in constant service than if they are allowed to lie idle or to remain loaded with damp cinders or coal. A number of underframes were examined on hopper cars that had been in service for 14 years and were found to be in excellent condition.

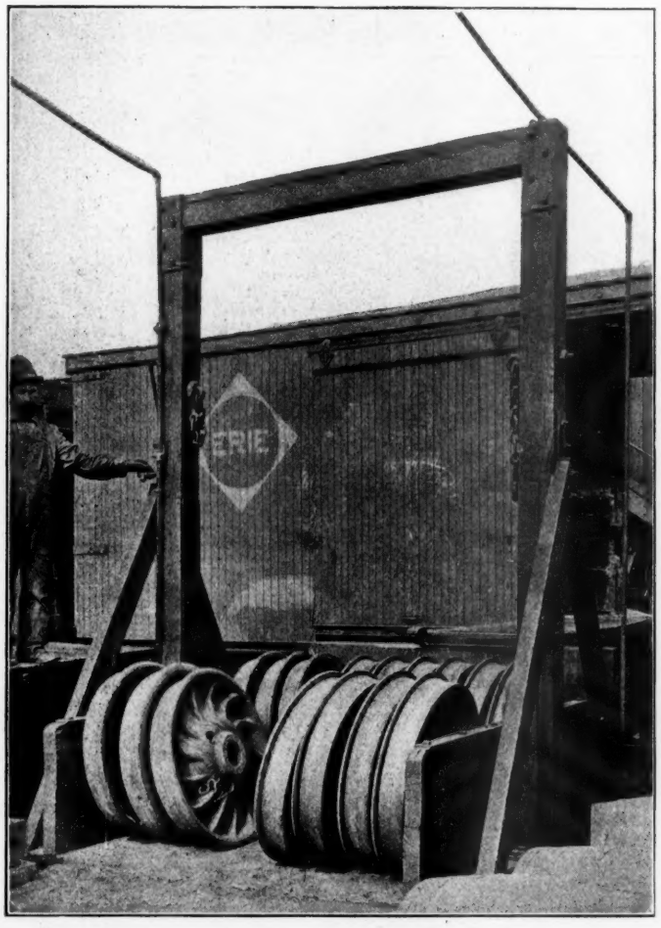


Fig. 12—Sixteen Car Wheels on Hoist Ready to Be Raised.

CART FOR MOUNTED WHEELS.

A convenient cart for moving mounted wheels about the yard is shown in Fig. 11. To pick up a pair of wheels this is tipped over to one side enough to allow the wheels and axle to be run under it. The hook is placed under the center of the axle, and then by bearing down on the handle of the cart the front wheel is raised off the ground, the fork at the same time coming down over the axle near the rear wheel. A bolt or rod is slipped through the holes in the fork underneath the axle, and by raising the handle of the cart both wheels are lifted clear of the ground. As the axle is hung from near the center the weight may be very evenly balanced. To unload the wheels, the operation as described is reversed. The wheels on the cart are 42 in. in diameter and have steel tires 2 in. wide. A spring which supports the upper end of the I-bolt, from which the hook that carries the axle is suspended, makes the cart ride more easily.

WHEEL HOIST.

A convenient hoist for loading and unloading wheels from cars is shown in Figs. 12 and 13. As many as 16 wheels may be placed on the platform of the hoist at one time. By admitting air to an 18-in. cylinder placed in the pit underneath the platform it may quickly be raised to a level with the floor of a flat or box car. To guard against accident, due to a sudden fall in the air pressure or other cause, the two hooks which are shown attached to the uprights are slipped under iron rods at the top of the side walls of the platform. The platform is 6 ft. wide between the sides and 8 ft. long. To steady it, braces or brackets are attached to the under side and bear against the uprights, the sides of which are covered with steel plates. There are three of such brackets to each upright, and there are also smaller brackets at about the middle of each end of the pit, these latter brackets bearing against plates which are attached to the walls of the pit. The uprights or columns are of timber, about 7 in. x 7 in. in section. A movable loading platform extends from the car to the hoist.

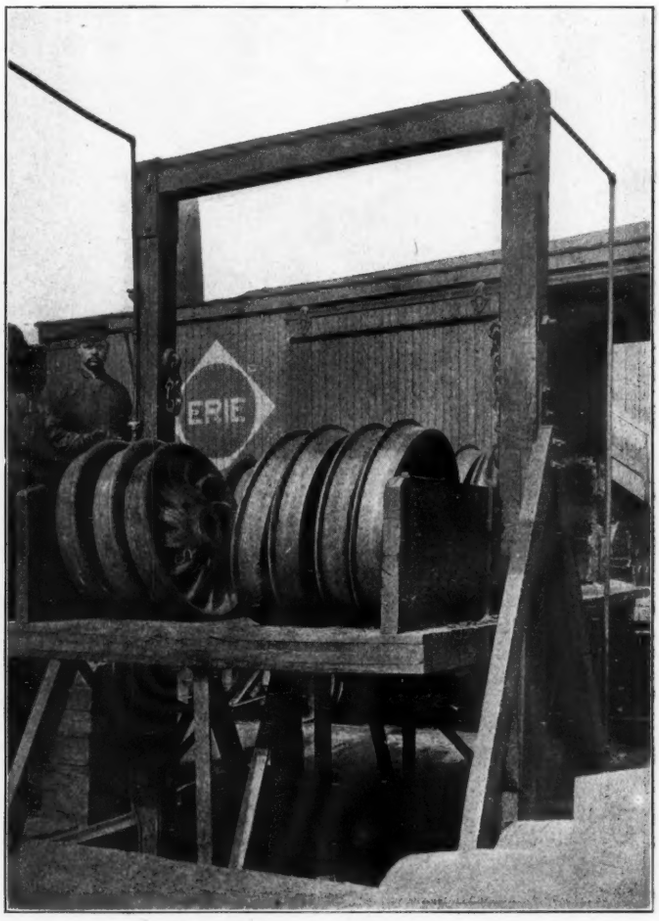


Fig. 13—Wheel Hoist Raised to Level of Car Floor.

The air cylinder is constructed of two 18-in. cylinders, one on top of the other, and connected to form a single cylinder. These were at one time used on portable air jacks for raising loaded freight cars or passenger cars, but proved to be too heavy and bulky to be used advantageously for that purpose.

TIMBER HOIST.

Large timbers are often loaded in gondola or hopper cars and are difficult to unload unless some special provision is made for doing so. For this purpose a stationary hoist extending over two tracks is used, as shown in Fig. 14. The timber is unloaded from the cars on lorry trucks and transferred to any part of the yard. The cylinder on the hoist is

12 in. in diameter and has a stroke or lift of 8 ft. It is operated from the platform at the right by the use of an old engineer's valve. The cylinder is supported by a small carriage, which operates on two sheaves on a track of bar iron.

STORAGE RACK FOR STEEL BARS.

The material rack for storing steel rods and bars, shown in Fig. 15, is built better and is more substantial than racks

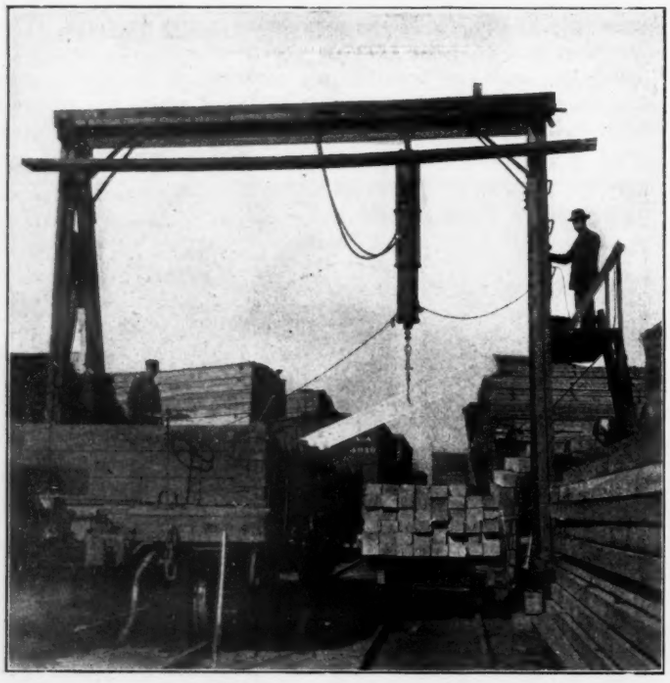


Fig. 14—Timber Hoist.

ordinarily used for this purpose. It is 40 ft. long and about 17 ft. deep and rests on concrete piers, there being five of these extending the full length of the rack. The cast iron uprights are about 9 ft. high and are spaced 2 ft. center to center lengthwise and about 4 ft. 3 in. center to center crosswise. These cast iron standards are about 1½ in. x 5 in. in

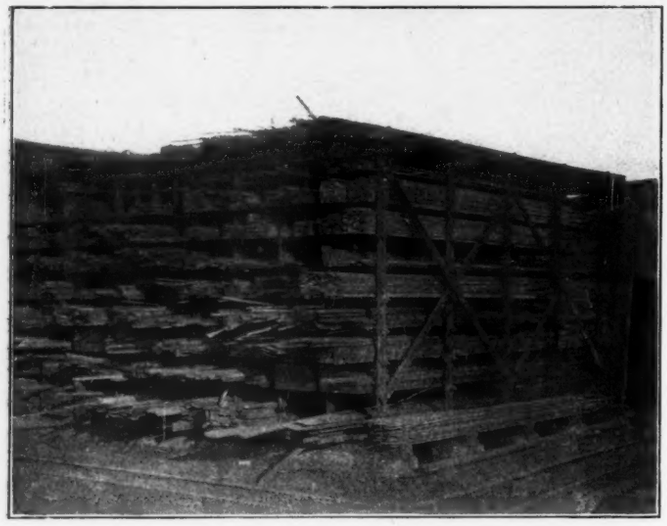


Fig. 15—Partial View of Steel Storage Rack.

section, with ribs at the middle of each side, making the maximum width at the bosses 4 in., tapering down to a minimum of 2½ in. midway between the cross rods. The 1⅛-in. cross rods have pipe spacers upon which the material rests. The cross rods are spaced vertically about 1 ft. center to center, except for the lower one, which is 18 in. above the base, and the upper one, which is 6 in. below the under side of the top timber. It will be seen that the two upper rows are divided lengthwise into smaller sections by the use of pieces of ½ in. x 2½ in. iron placed midway between the cast iron posts. The rack is tied at the ends by two sets of diagonals of 4 in. x ½ in. iron; one set of these is shown in a partial side and end view of the rack, Fig. 16. The timbers used at the top and bottom to tie the structure together are 5 in. x 8 in. It is the intention to cover the rack over to protect the material from the weather.

PAINT SPRAYER.

As on many other railways a paint sprayer is used for painting freight equipment. It saves greatly in labor, although the winds at Buffalo prevent any saving in material, if indeed they do not at times offset at least a part of

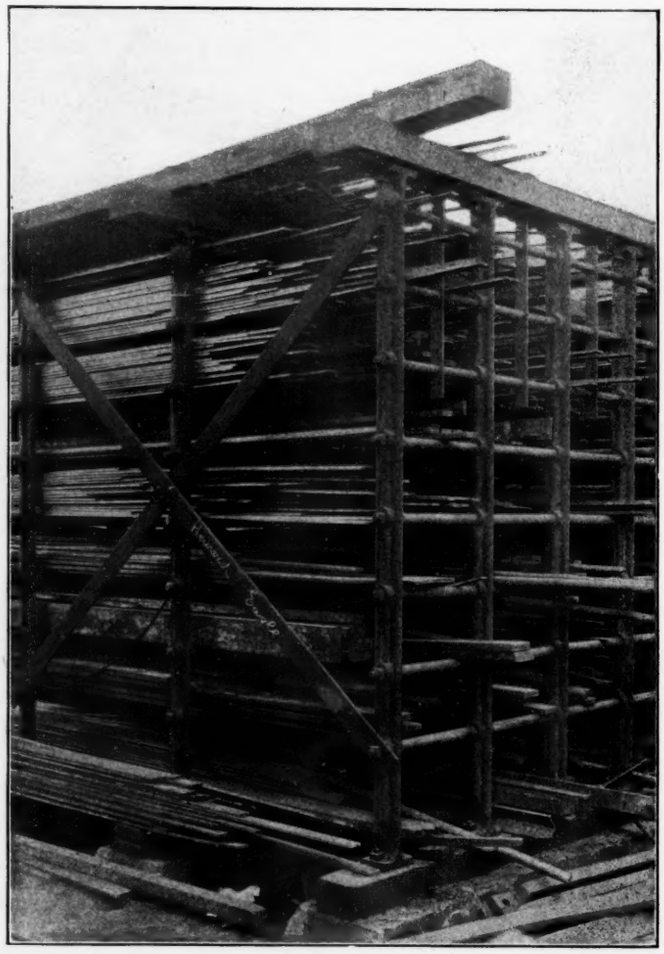


Fig. 16—Partial Side and End View of Steel Storage Rack.

the advantage of the saving of time and labor. The operator realized that he was being timed when the following test was made, and it probably represents considerably better than average practice, although in order not to get the paint on too thick it is necessary for the operator to either keep moving or to shut off the device and stop. The time, taken from when he started operations with a full can of paint (one gallon until he had finished one side and one end of a 36-ft. 70,000-lb. capacity gondola car, inside height 3 ft. 11 in., was five minutes and ten seconds. This included the time for the partial refilling of the can of paint, which required 30 seconds, and also the touching up of two or three spots at the finish, which required about 20 seconds. The operator usually wears a mask over his nostrils. The car was thoroughly and evenly covered and only a very few drops of paint dripped off. The paint seemed to have penetrated

into all the cracks and crevices. The paint sprayer is shown in operation in Fig. 17.

The paint sprayer (Fig. 18) weighs about 6¾ lbs. when empty and 16 lbs. when filled. In addition, the weight of that part of the air hose which hangs from it must be considered. By pressing the handle at the side, air is admitted through a ½-in. pipe. A spring automatically closes the valve when

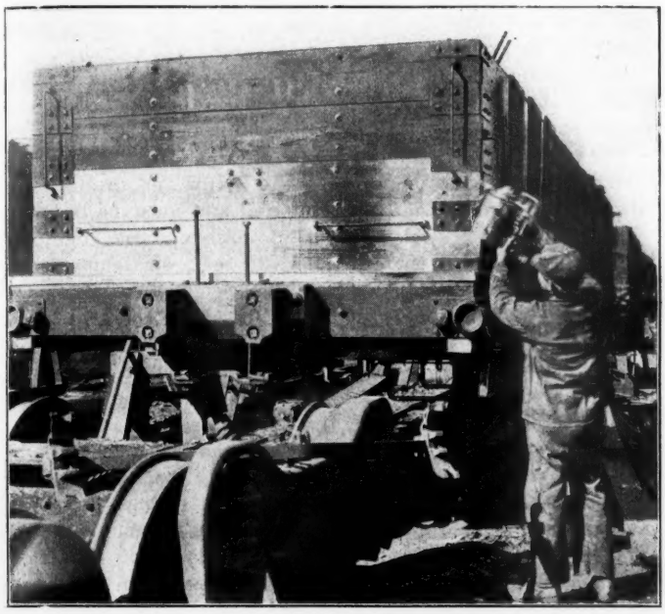


Fig. 17—Painting a Car with the Spraying Machine.

pressure is removed from the handle. The mixture of paint and air is forced out through the T on the ¼-in. pipe, no special nozzle being required. About three gallons of paint are required for the first coat on a new gondola car, such as described above.

ELLIPTICAL SPRING TESTING APPARATUS.

A home-made device for testing the elliptical springs on

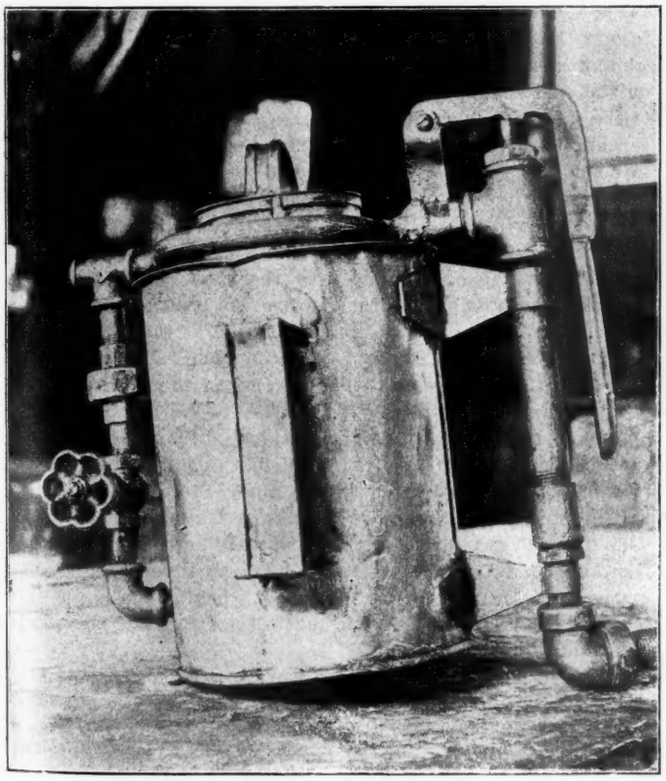


Fig. 18—Paint Sprayer Used for Painting Freight Cars.

passenger equipment is shown in Fig. 19. The air cylinder is 18 in. in diameter and was taken from an old hydraulic jack. The pressure per square inch on the cylinder is indicated by the air gage. A table on the wall back of the machine shows the total pressure on the spring to correspond to the various gage pressures, and is as follows:

Pressures					
Gage.	Total.	Gage.	Total.	Gage.	Total.
10	2,544	42	10,687	70	17,812
20	5,089	45	11,451	75	19,085
25	6,361	48	12,214	80	20,357
30	7,634	50	12,723	85	21,629
35	8,906	55	13,995	90	22,902
38	9,669	60	15,268	95	24,174
40	10,178	65	16,540	100	25,447

The springs are checked as to the height under the load which they must carry on the car, and if found deficient are reset. Ordinarily the springs are tested only when there is some question as to their capacity. The apparatus is also

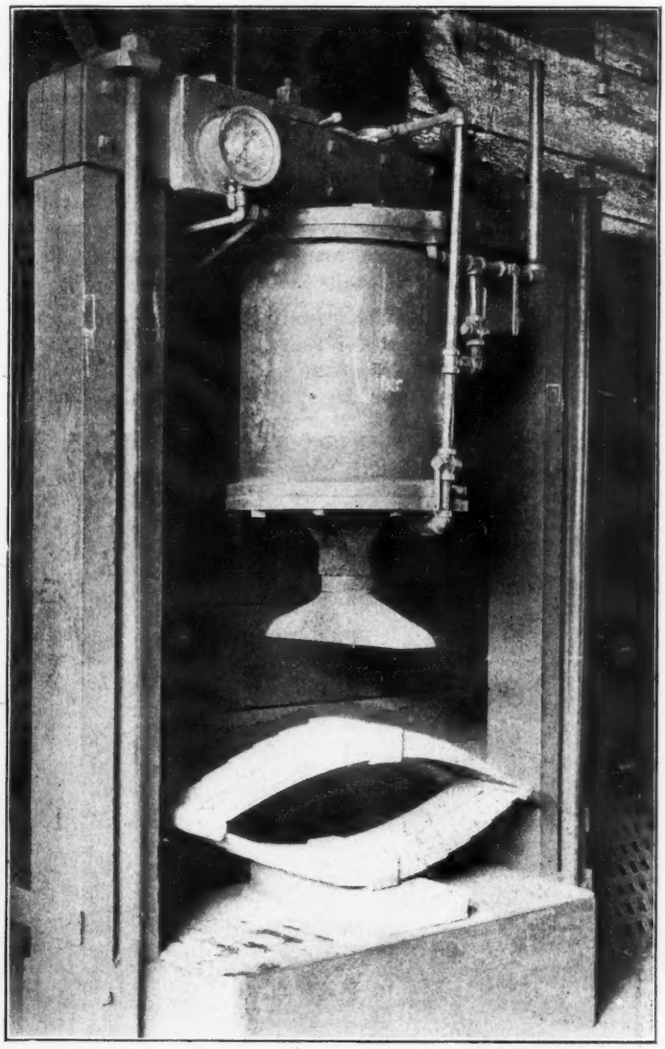


Fig. 19—Spring Testing Apparatus.

found useful for compressing the springs and placing a clamp over them to facilitate placing them in the trucks. Formerly a spring was used to force the piston upward when the pressure was released, but it did not prove strong enough, and provision was made for allowing the air to enter underneath the piston when it was desired to force it upward.

MAKING CABOOSE STEPS.

The law requiring the lowering of caboose steps has made it necessary to provide thousands of new brackets for these steps. A bulldozer at the Buffalo shops manufactures all of these for the system. The problem was to devise dies by

which all of the bends could be made in one heat and practically one operation. It was done by making two sets of dies, as shown in Fig. 20, and using a separate cylinder for operating each set. One die acts in advance of the other and completes its work before the other one starts to move. Ten-inch air brake cylinders are used. At present the bolt holes

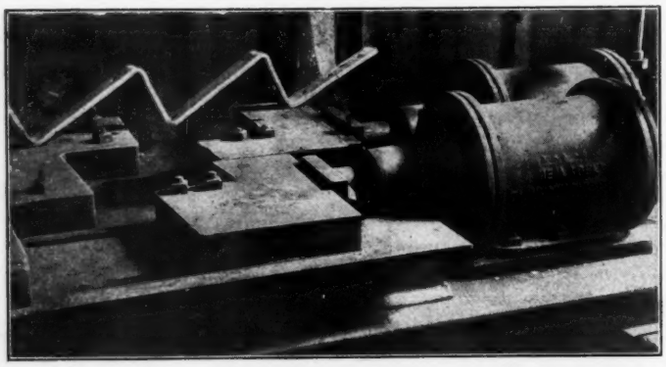


Fig. 20—Bulldozer and Dies for Making Caboose Steps.

in the brackets are drilled after they are bent. Experiments are being made with a view to punching the holes in the ½-in. x 2-in. bar and bending it afterwards. This can, of course, only be successfully accomplished by heating the bars uniformly and to the same temperature and having the conditions of handling standardized.

GUARD FOR CROSS CUT SAW.

A splendid safety guard for use on cross cut saws has been devised by W. T. Duffin, foreman of the passenger car department, and is shown in Fig. 21. This guard of galvanized iron

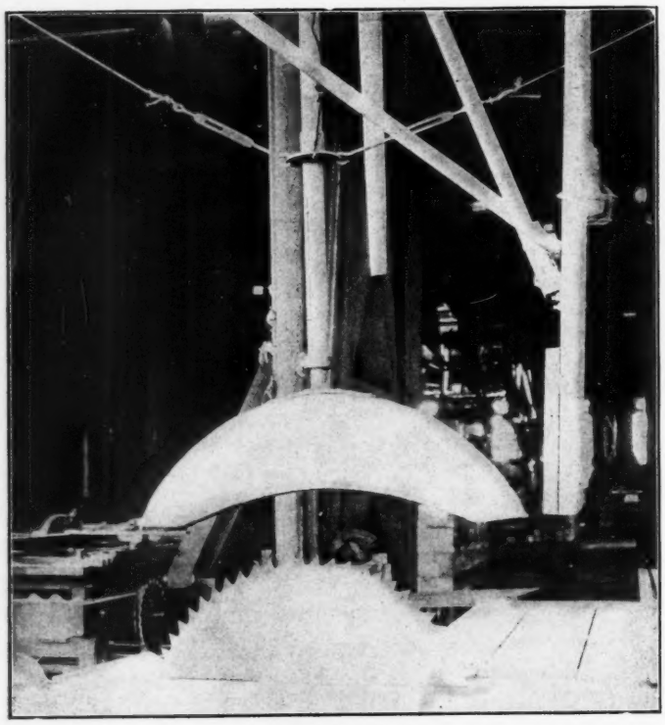


Fig. 21—Substantial Safety Guard for Cut-off Saws.

is attached to the lower end of a piece of pipe, which fits in another piece, as shown, and which has a cord attached at its upper hand which extends upward through the pipe and over a couple of pulleys to a counter weight in a box alongside one of the columns. The guard may thus be easily moved up and down and be adjusted to suit the size of the timber to be cut. When placed in the desired position it may be temporarily fastened by means of a set screw.

THE ECONOMICAL USE OF COAL.

The Pennsylvania Railroad has recently issued a revised circular containing detail and complete instructions to enginemen and firemen for the economical use of coal on locomotives, which reads as follows:

Enginemen and firemen must work together so as to save coal and reduce smoke, and when taking charge of a locomotive must see that the fire, grates and ash pan are in good condition, so as to prevent engine failures on the road.

Enginemen must include in their reports all defects causing leaks of steam or water in any part of the locomotive, as the repair of these defects will avoid loss of coal.

The burning of bituminous coal in a locomotive requires air, which must be admitted through the grates and through the fire door. Smoke means waste of coal and must be avoided. Large quantities of coal placed in the firebox at one time cool down the fire, cause smoke and waste coal; small quantities at regular intervals will keep the fire bright, prevent smoke and take less coal to keep up steam pressure. Lumps of coal should be broken in pieces not larger than three inches. A bright and level fire over the whole grate must be carried whenever possible. When a sloping fire is used, no more coal should be banked at the door than is necessary.

To prevent smoke and to save coal, the fire door must be placed on or against the latch after firing coal or using the scraper, slash bar or hook, and when on sidings, in yards, at terminals or before starting. Before the throttle is closed, the blower must be used and the door placed on the latch. Firemen must stop firing long enough before steam is shut off to prevent smoke and waste of coal.

Dead spots in the fire must be avoided when running with throttle closed, as this frequently causes the flues to leak.

The grates must be shaken as often as is necessary to clear the fire of ash and clinker in order to admit sufficient air, and in such a manner as to avoid the loss of good fire. Care should be taken to place the grates level after each operation.

The waste of steam at safety valves must be avoided. One shovel full of coal is required to make the steam that escapes from a safety valve in one minute.

The sprinkling hose attached to the injector must be used frequently to keep down dust on the foot plate and in the cab and to wet the coal in the tender. However, too much water on the coal should be avoided, as to some extent this practice is the cause of flues stopping up. Coal must not be allowed to collect or remain on the foot plate, but should be swept into the coal space of the tender and not out on the tracks.

Engines must not be brought into terminals with a dead fire, which will cause the flues to leak; nor with too heavy a fire, which will cause waste of coal.

When banking or cleaning fires, the blower should be used as lightly as possible. After the fire has been cleaned of ash and clinker, the clean fire must be placed at the front end of the grates and maintained in good condition. When cleaning fires or with a banked fire, excessive use of the injectors must be avoided, as this will result in injury to the flues.

After taking coal at coaling stations, the fireman must do the necessary trimming of the coal pile to insure the prevention of coal falling off of tenders while in transit, which is both wasteful and dangerous to passing trains, trackmen, etc.

Coal can be saved by the proper use of the injector in pumping the locomotive regularly, and by taking advantage of every opportunity to fill the boiler when not working the locomotive to full capacity; also by using the injector to avoid the safety valves blowing off.

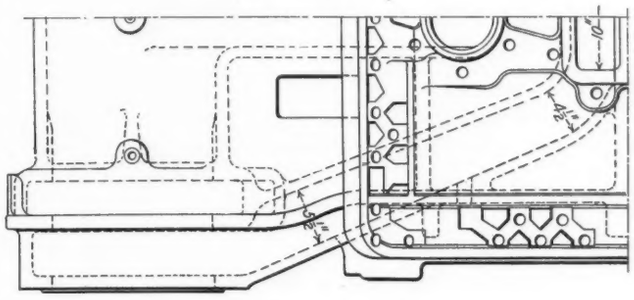
Coal will be saved by always working the locomotive (except when starting) with a full throttle when the cut-off is one-quarter of the stroke or greater; but if one-quarter cut-off with full throttle gives more power or speed than is needed, the reverse lever should be left at one-quarter cut-off and the throttle partially closed as needed.

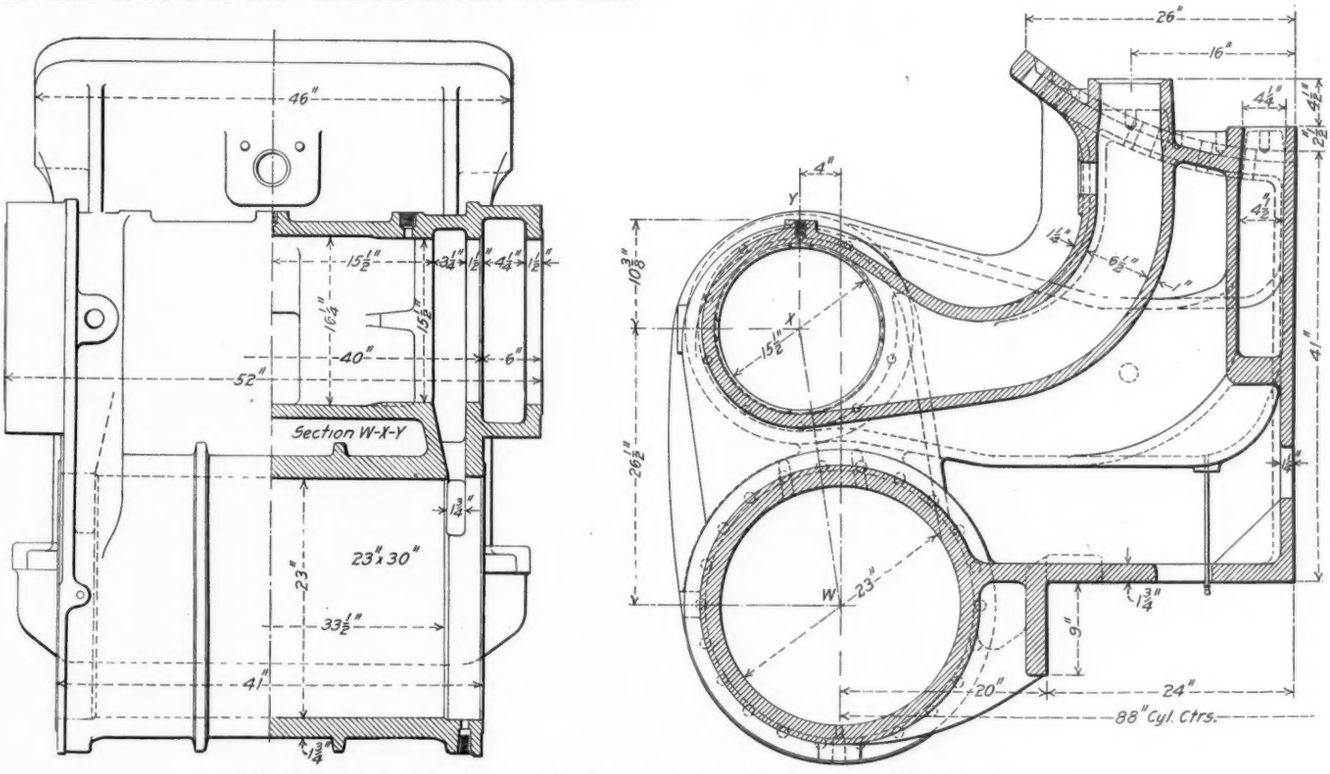
CONSOLIDATION LOCOMOTIVE, CHICAGO, MILWAUKEE & ST. PAUL.

The Chicago, Milwaukee & St. Paul has built at the Milwaukee shops during the past year about 100 large locomotives, including 25 of the consolidation type here illustrated. The company has also given orders for 50 similar locomotives to the American Locomotive Company and 50 to the Baldwin works. The St. Paul has also built 25 mikado locomotives, which have larger boilers and are much heavier, and are found useful for service on mountain grades, but for general freight service the consolidation engine is lighter per unit of tractive effort and is found preferable to the mikado type.

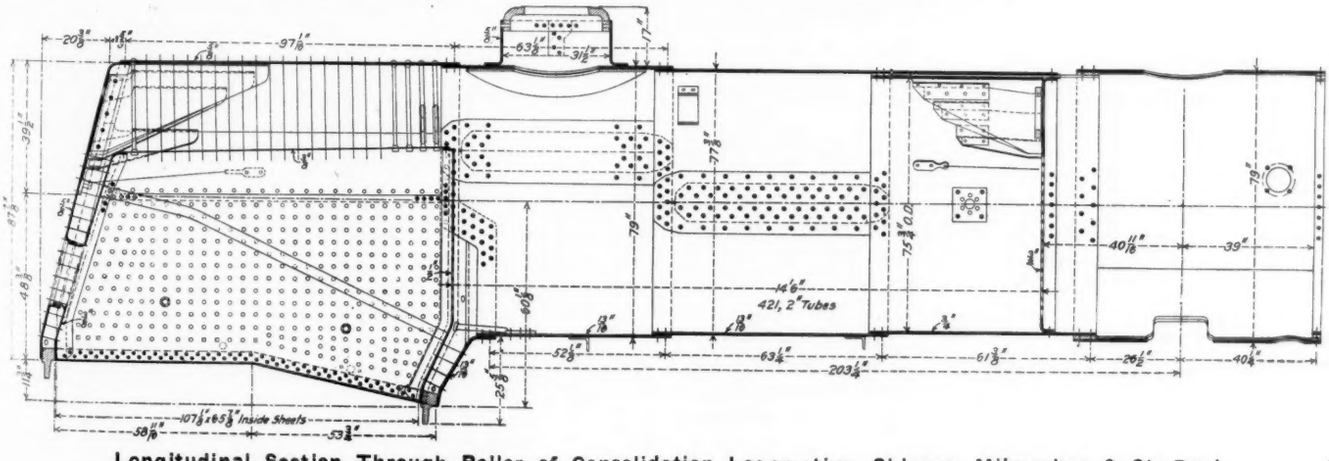
The consolidation has cylinders 23 x 30 in.; driving wheels, 63 in. in diameter; weight on drivers, 189,200 lbs., and with 200 lbs. of boiler pressure the maximum tractive effort is 42,800 lbs. The boiler shell is made of three cylindrical sheets, the front one 75¾ in. outside diameter and ¾ in. thick. The other shell sheets are $\frac{13}{16}$ in. thick. There are 421 2-in. tubes spaced ⅝ in. apart. This is somewhat closer than the usual practice, which is ¾ to ⅞ in. The wider spacing allows better circulation, especially if the tubes accumulate any extra thickness of scale or mud. It seems to have been demonstrated that the evaporating capacity of the boiler is not reduced by the use of the smaller number of tubes required by the wider spacing.

The working boiler pressure on the St. Paul is still maintained at 200 lbs. on new engines, though the general practice in the West in recent years has been to reduce this to 170 or 180 lbs. The firebox is radially stayed, and the firebox side sheet is nearly vertical, while the outer sheet inclines slightly

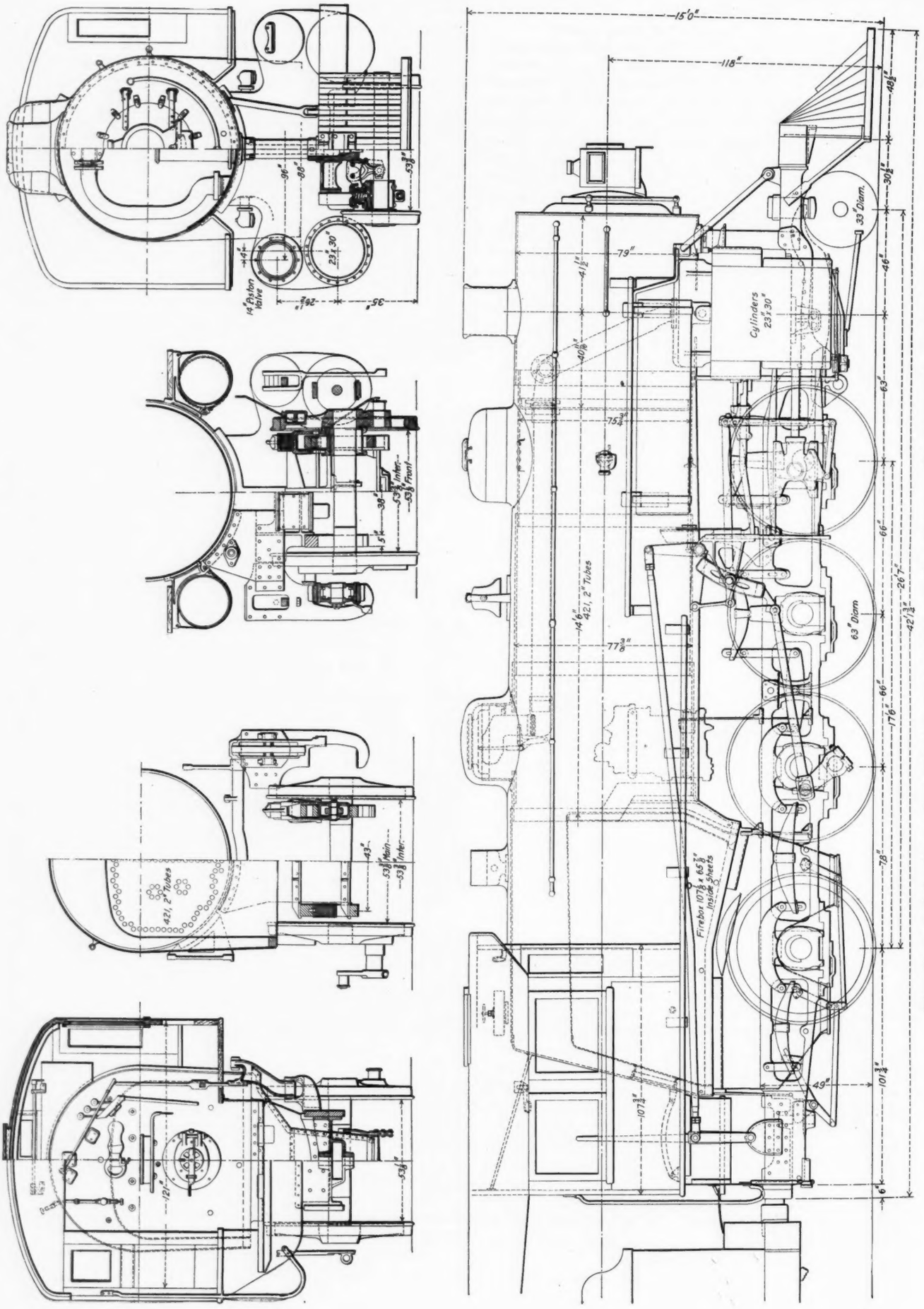




Cylinder Details; Chicago, Milwaukee & St. Paul Consolidation Locomotive.



Longitudinal Section Through Boiler of Consolidation Locomotive, Chicago, Milwaukee & St. Paul.

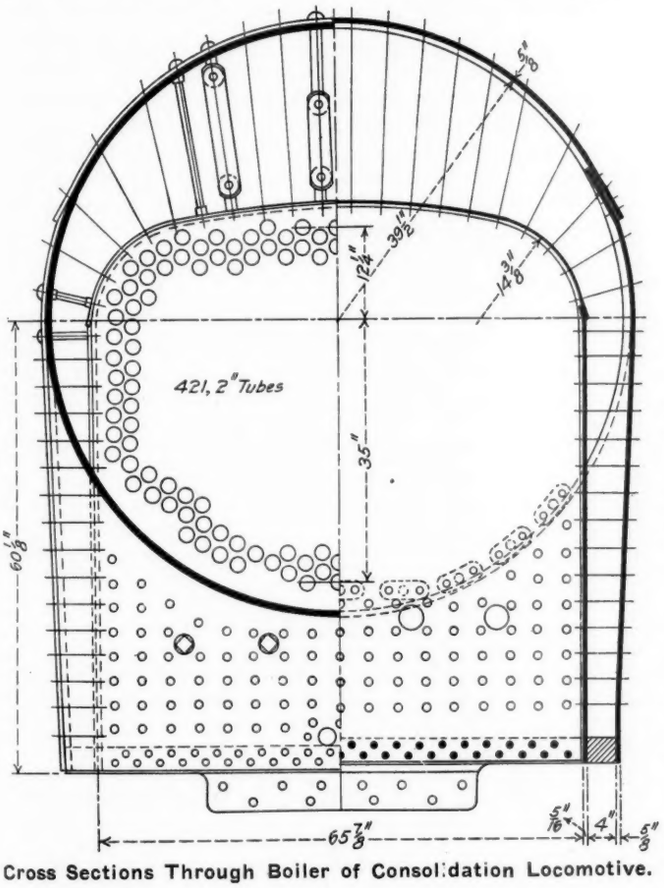


Elevations and Sections; Consolidation Locomotive for the Chicago, Milwaukee & St. Paul.

outward, increasing the width of the water leg from 4 in. at the mudring to 6 in. at the top.

The brick arch is supported on four 3-in. tubes. The firebox is deeper at the front end to provide a good depth of fire below the tubes; the distance from the mudring to the lower tubes is about 2 ft. The water space at the throat is 6¼ in. wide, providing good circulation to the side sheets. The simple gear for operating the ash pan doors is shown in the general plan. They swing on parallel links and close with a flat face against the hopper. The frames are wrought iron, 5 in. thick, 5½ in. deep over the pedestals, and 4½ in. deep between pedestals. They are braced laterally on both the top and bottom bars, ribbed castings being used for this purpose.

The cylinders are shown in detail. The saddle and cylinder are in one casting, and the piston valve chest center is 4 in. outside the center of the cylinder, so as to provide a well balanced arrangement of the valve gear levers. The walls of the cylinder are 1¾ in. thick and those of the valve chest are 1¼ in. thick; there is a very short and direct passage for the steam from the chest to the cylinder. The arrangement



Cross Sections Through Boiler of Consolidation Locomotive.

of the Walschaert valve gear is shown plainly on the general drawings. There is a substantial crosshead and guide for the valve stem which distributes the pressure at this point over a large area and must be useful in preventing the rapid wear of valve stem packing. The main and side rods, driving and truck axles and many other forgings are of wrought iron made of scrap billets well hammered. When thus made iron locomotive forgings are much cheaper than steel, and are found satisfactory in the service of this railway. The tank has a capacity for 7,000 gals. of water and 10 tons of coal. The tender frame is made of heavy channels with wide rectangular brace plates.

The principal dimensions, weights and ratios are given below:

Ratios.

Weight on drivers ÷ tractive effort	4.42
Total weight ÷ tractive effort	5.04
Tractive effort x diameter of drivers ÷ heating surface	800.30
Total heating surface ÷ grate area	69.04
Firebox heating surface ÷ total heating surface, per cent.	6.37
Weight on drivers ÷ total heating surface	56.16
Total weight ÷ total heating surface	64.02
Volume, both cylinders, cu. ft.	14.40
Total heating surface ÷ volume of cylinders	233.97
Grate area ÷ volume of cylinders	3.38

General Data.

Service	Freight
Fuel	Bituminous coal
Tractive effort	42,800 lbs.
Weight on drivers	189,200 "
Weight on front truck	26,500 "
Weight of engine, total	215,700 "
Weight of engine and tender	350,250 "
Wheel base, driving	17 ft. 6 in.
Wheel base, total	26 " 7 "
Wheel base of engine and tender	60 " 2 "

Cylinders and Valves.

Cylinders, diameter and stroke	23 x 30 in.
Valves, type	Piston
Valves, diameter	14 in.
Valves, maximum travel	6¼ "
Valves, steam lap	1 "
Valves, exhaust clearance	0
Valves, lead	¼ in.

Wheels and Journals.

Driving wheels, diameter	63 in.
Driving journals, main	10 x 12 "
Driving journals, other	9½ x 12 "
Truck wheels, diameter	33 "
Truck journals	6½ x 12 "

Boiler.

Working pressure	200 lbs.
Diameter, first ring	75¾ in.
Firebox, width and length	65⅞ x 107⅛ "
Tubes, number	421
Tubes, diameter	2 in.
Tubes, length	14 ft. 6 in.
Heating surface, tubes	3,173.5 sq. ft.
Heating surface, firebox	195.7 "
Heating surface, total	3,369.2 "
Grate area	48.8 "

Tender.

Journals	5½ x 10 in.
Water capacity	7,000 gals.
Coal capacity	10 tons

THE COMPENSATION OF WORKMEN.*

BY H. L. GANTT.

In any discussion of this subject, however much we may differ as to the means by which our end is to be accomplished, we all must agree that if there is a final solution it must be an equitable one. Any solution, therefore, which is based upon the ability of the more powerful party to impose its will on the other, is only temporary and liable to be reversed. High wages can only be paid permanently for high efficiency, and any attempt to get high wages without a corresponding efficiency can only be temporarily successful. This is an economic law, and any man or body of men that exacts a compensation out of proportion to the service rendered will ultimately come to grief.

The supreme importance of efficiency as an economic factor has only recently begun to dawn upon the world. The Japanese, in their war with Russia, gave us an illustration that we should not forget. The present tension between Germany and England is due almost exclusively to the fact that the efficiency of the Germans is greater than that of the English. That labor, both skilled and unskilled, is, as a rule, inefficient is an undoubted fact, but it leads us to ask about the efficiency of management. Not long ago I visited a machine shop, whose name was for a long time well and favorably known throughout the East, and saw a 24-ft. boring mill being driven at a snail's pace by a 4-in. single belt. The steel chips that were being removed were cool enough to be picked up by the hand without discomfort, and the workman was trying to while away the weary hours by reading a week-old newspaper. The cutting tools were of modern high speed steel, but tools made from old files would probably have done satisfactory work at the speed used. To be sure the new steel tools needed less grinding than the old files would have needed, but the special value of high speed steel is not that it makes less labor for the workman, but that it is capable of doing so much more work at the same time. This case is not a question of workman, but of management, and until those at the head of this establishment

*Read before the National Metal Trades' Association, Hotel Astor, New York, April 14, 1910.

realize that efficiency of operation is more to be considered than the length of time a tool will last, it will be impossible for them to take again the place they once held in the industrial world. If they had even the elements of a modern cost system the value of the time element would begin to dawn upon them.

Turning again to the workman we ask why is he inefficient. A little consideration of the methods of compensation that oftenest exists leads us irresistibly to the conclusion that there is but little inducement offered to him to be anything else. We can hardly expect him to understand the importance of a subject so many better educated people so utterly fail to appreciate, hence the only inducement that appeals to him is the immediate one of increased pay. We must not expect him to learn any more than this except by a long series of object lessons. It is therefore up to the educated man to learn economic laws and set the workmen an example by conforming to them.

Under the system of day work that oftenest exists but little provision is made for awarding extra compensation to the efficient man, and under the most common form of piece work, he is liable to be penalized by having his rate cut if he does much more than was expected. Any attempt to remedy this condition is praiseworthy, and the metal trades have made more progress in this direction, by far, than any other industry. We realize, however, that although a start has been made, it is only a start, and that very much remains to be done. Hence we naturally ask what the next step is.

While studying the operation of a large factory recently, we discovered one department in which the orders were handled in a most creditable manner. On talking with the clerk who had charge of these orders, we found that he had devised the method himself, and this was confirmed by the fact that we saw a mild imitation of his method in another department. We called attention to his work in our report, and got the reply that the work of his department was nearly always on time. Our suggestion was that, as a temporary expedient, much improvement could be gotten by relieving him of his routine duties and having him install his method in the other departments. There are in many plants, both among the mechanics and clerks, men who are far more capable than the average, and who, if they had the chance, could do much to increase the efficiency of the whole plant by teaching their methods to those whose methods are less efficient.

The question at once arises as to why we do not make foremen of such capable mechanics, and the reply comes just as quickly that they often have no ability as executives and make very poor foremen. We realize, however, how much the efficiency of the shop would be increased if the other workmen had their efficiency. The best way to get this increase of efficiency is to make our expert men instructors, and award additional compensation to those that learn. This is a step in the direction along which we have been working, and according to which, in its best development, we have succeeded in increasing the average efficiency of shops to a point greater than that of the best workman before we started. As our time is limited I shall not go into the details of our method, but will refer you to my paper on "Training Workmen," read before the American Society of Mechanical Engineers at their New York meeting, December, 1908.

In brief, our method is to put into the shop a system of orders and returns that ensures any work being done as we direct. Then each job is analyzed by the best expert available, who specifies the sequence of the operations and ultimately how they shall be done. Plans are then made and orders issued to have the work done as the expert directs. Finally, each operation is studied in detail by an expert, who determines the best method and shortest time in which it can be performed. A task is then set in accordance with the study of the expert, who gives detailed written instructions for carrying out his methods.

The workmen are paid additional compensation when they accomplish the task in the time and manner specified, and the foreman, who acts as an interpreter of the directions of the expert and an instructor, is awarded additional compensation for each workman who performs properly each day all his tasks. In order that the foreman may be induced to give his attention to the least efficient man, he is given additional compensation if all his task workers succeed.

I wish to say one word about arbitration of labor questions. As a temporary expedient it is often the best we can do and should be used when necessary; but as a fixed industrial policy arbitration of questions involving compensation is absurd, for the arbitrators can never know enough about the real problems involved to effect a permanent solution. If, however, the policy of encouraging efficiency is adopted, and the best use is made of scientific knowledge, the results are often so marked that both sides can get greater benefits than those they were contending for. Any board of arbitration should recognize the limitations of its decisions, and should insist as a part of its finding, that some reasonable method of rewarding efficiency be installed.

For several years past the writer has been training workmen on the lines indicated above, and although his work has usually been with people older than the ordinary apprentice, his results have been successful to a degree entirely unanticipated. About five hundred of those so trained are textile workers who are now earning at an average of 40 per cent. more than previously, and turning out over 100 per cent. more work, some as much as 300 per cent. more. The average wage cost per unit has been reduced to about 60 per cent. of what it was.

One other result, which was to be expected in a general way, is that the trained workman, working under expert teachers, should also produce better work, but we were not quite prepared to find the extent to which this was so in some cases.

If we wish to improve the ordinary workman up to a point where his work compares favorably with that of the efficient workman, we must do so by making it to his financial interest to learn, and to that of the expert workman to help us teach, for the ordinary workman must be taught and trained.

FOREIGN RAILWAY NOTES.

According to reports on the progress of the Alcobaca Railway, which is being built between Alcobaca, Brazil, and Praia de Rainha, this line is now finished to a point on the Tocantins river below Itaboca Falls, and a temporary Decauville line has been built connecting the finished section of the railway with the steamers which ply the river above the falls. Work on the railway will be pushed rapidly with the beginning of the dry season, and it will not be long before the line will reach a point above the falls, and thence to Praia da Rainha, which will be for the present the terminus of the line.

In commenting on the necessity of raising rates on the Swiss railways the federal council says: "Thus, much as it is deplored, one of the cherished hopes of the nationalization of our railways is shattered. The necessity is, however, apparent to place the railways on a sound financial footing and to avoid continual deficits. It must now be acknowledged that the original reduction of the traffic rates went too far, and that the construction of new buildings, addition of new trains and other improvements must proceed slowly. The Swiss Federal Railways is not the only administrative undertaking that made a poor showing during the last year (1909) between receipts and expenses. A number of Swiss private railways, the Austrian State Railway, the Austrian Southern Railway and the Würtemberg State Railway have been obliged to raise rates to cover growing expenditures."

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.

The sixth annual convention of the International Railway General Foremen's Association was called to order at the Grand Hotel, Cincinnati, Ohio, May 3, 1910, at 10 a. m., by the president, T. H. Ogden, general foreman of the Atchison, Topeka & Santa Fe at Dodge City, Kan. Rev. Charles Frederick Goss of the Avondale Presbyterian Church, invoked the Divine blessing.

PRESIDENT OGDEN'S ADDRESS.

President Ogden, in making his presidential address, spoke as follows: "The practice of economy which we were compelled to establish during the past few years will in many cases be well continued under normal conditions and if you will bear with me to-day I will dwell for a time on the subject of rigid economy in the shop and roundhouse, as it is a subject of vital importance and should be given careful and continuous attention. I emphasize this matter the more forcibly because of the fact that it was recently called to my attention by the head of one of our large railway systems, who stated that he was interested in our organization and hoped that we would make a record to be proud of, but he regretted to say a great many foremen had apparently lost sight of the many little leaks about the shop and roundhouse. The lack of proper care of tools and supplies in the operation of the plant is an item of greater importance than the average foreman may think, and extensive investigation has demonstrated the fact that the expense at some stations is greatly in excess of what it should be and could be avoided if the foreman would take the matter in hand and stop not only that leak and many other similar ones.

"A few years ago railway mileage was counted by the hundreds and heads of departments were personally acquainted with the most of the men under them, while to-day the railway mileage is counted by the tens of thousands and the heads of the departments are far removed from the men in the ranks and only know them by the reports showing the results of their work and the cost of doing it. We have become mere cogs in the great wheel of progress, known only by the work we perform and the results we obtain.

"Another vital matter which has been brought to my notice is the question of harmony and co-operation which should exist between the general foreman and the foremen and men under him, as well as with the master mechanic and the higher officials of the mechanical department and the members of other departments with whom we come directly in contact. We should not lose sight of the fact that in harmony and co-operation in our shop organization lies our strength upon which depends our efficiency and success. We must not allow a feeling of distrust to be created among our foremen or workmen. Keep close together, as in addition to harmony and co-operation we should practise team work with our men and with the enginemen and with the other officials.

"It has been stated to me since our last meeting that many foremen show indifference to the work reported by the enginemen; we must not overlook the fact that by maintaining harmony with the enginemen we gain their confidence and support, which is essential to our success and will be recognized by our superiors as ability to assume positions of leadership and responsibility. So let us in our various positions strive to create a harmonious feeling and to keep out the feeling of distrust among our shop force and all with whom we are associated in the performance of our duties. If we can accomplish this our work will be easy and our efforts to install new ideas in the shop work will meet with approval and success and we will have the support of all in the systematic and economical operation of our department."

F. C. Pickard (C., H. & D.): Yesterday a foreman told me he could not get away to attend the convention. Whenever a man is in that condition, and is holding the position of general foreman, there is something wrong with the man and his organization.

The efficiency of the mechanical department depends upon the co-operation of the general foreman and his subordinates, and also of the other departments. One most essential thing for increasing the efficiency of the mechanical department is in the handling of locomotives. The first step in the matter is attention to the time that a locomotive is cut off in the yard until it can be made ready. That calls forth an effort on the part of every foreman and every individual that may come under your supervision.

We have a plan on our road by which we call together every shop foreman on Monday morning and we discuss the various things of interest to our department. We might say to the general foreman, "We only got out five engines last week and we should have gotten out six." There is a representative of the store department there. The delay may be on account of the material; if it is, he tells us what efforts have been made to get it and what service we are going to get in the future. It may be the blacksmith shop is at fault. Perhaps the blacksmith shop lacked air pressure. It may be the machine production. In this way the discrepancies of the various departments are put before the head of the department and the best of results are obtained.

You men are daily coming in contact with the men under you. Do not criticize an individual and not question him. The success of almost every mechanical man is brought about by questioning him and getting him to think. Whenever you get him to thinking you are going to get results, and he will produce the highest efficiency that lies in his power and ability.

Another thing that is attracting considerable attention is fuel economy. We have in this country about 63,000 locomotives. If each and every individual of the mechanical departments of the railways would set about to obtain efficient results in the roundhouse and in each department, we could save a million tons of coal a year.

We inaugurated an apprentice school on our road about six months ago. When it was first suggested some of the men said we did not have the facilities, but we made them. We took two box cars, put them together and put windows in them, and you would be surprised at the results we are getting from the apprentice boys that started in the school six months ago. They are all students. There should be more students among the mechanical men.

You have all noticed the "Shop Kinks" that have been brought out by the *Railway Age Gazette*. It is performing a great service. We had a wheel lathe that was not producing results at all. By a little kink that we attached to the machine we increased the output fifty per cent. I recall another shop that had three machines, a coach wheel lathe, an old type lathe and a modern machine. The modern machine was working 15 hours; the coach wheel was working 9 and the other 10 hours a day. After they collected the shop kinks and put them on those machines, one man did all the work, and I have seen that man stop and turn car axles.

Angus Sinclair (*Railway and Locomotive Engineering*):—In addressing the International Railway General Foremen's Convention, I am conscious that I am speaking to a body of men whose daily duties exercise very great influence upon the economical operation of the 300,000 miles of railways on this continent. It is a fortunate thing for a railway company when the right kind of man has been selected to fill the position of general foreman; for his ability means the difference between good and inferior work or what is even of greater consequence, his influence makes the difference between harmony and discord in the shops where he has charge.

Railway construction began in the United States in 1830, when the total population of the country was less than 13 millions. The greater part of the population were engaged in agricultural operations and very few people were trained to mechanical pursuits. The conditions of life had made nearly all farmers and their help familiar with the handling of tools and they readily acquired skill when subjected to a little training in a machine shop. When the demand for mechanics arose to build and repair locomotives, thousands of rustics crowded away from the fields to manufacturing centers and proved themselves worthy of the call they had received.

An experience that the Baltimore & Ohio went through proved that the American workman could be depended upon to extend his operations very promptly to exact work when necessary. In 1830 Peter Cooper had experimented on the Baltimore & Ohio track with a tiny locomotive of his own design and construction which worked so well that the company in the following year offered a prize of $4,000 for a locomotive of 3½ tons weight capable of meeting certain conditions. Think of a 3½-ton locomotive for hauling trains! In response to this offer five locomotives were brought to the company, all designed and built by native workmen, all different in form and none of them imitating British types. Three were built by machinists, one by a watchmaker and one by an inventor, one of these handy men that have done so much to advance American industries.

In connection with the building of the Cooper locomotive that I have mentioned, part of the work was done by an apprentice in a Baltimore machine shop named James Milholland. That lad displayed so much mechanical ability that he was made shop foreman before he had finished his apprenticeship. He made his mark afterwards as a locomotive designer and inventor of improvements to railway machinery, and James Milholland is entitled to be regarded as the first general railway shop foreman. It was in such management as his that the succeeding improvements on the locomotive were

effected which made it the most efficient and convenient engine to be found in any country.

I am inspector of technical education of the Erie Railroad. It is the purpose of that road to give its shop apprentices instruction concerning the technical phases of a mechanic's work. The young men learn in a few years the technical principles of the business that have come to you from long experience and unaided study. The successful training of the apprentices depends very much upon the attitude of the general foremen towards them. To their credit I have found that all the foremen in the Erie shops have given hearty co-operation in carrying out the management's policy towards the apprentices, but I have known of other cases where the desire to educate apprentices was frustrated by the opposition of superintendents and foremen.

SECRETARY-TREASURER'S REPORT.

Mr. Bryan reported a total membership of 297, including active, associate and honorary members. There is a balance of $258.56 in the treasury. Mr. Bryan is entitled to great credit for the way in which he has handled the business affairs of the association. From a state of heavy indebtedness a couple of years ago, he has, by hard work, so improved its financial condition that after the proceedings of the present convention are published and all bills are paid it is expected that there will be a balance of about $1,000 in the treasury.

SHORTER CONVENTIONS.

The members of the association made a very wise decision in amending the by-laws to reduce the length of future conventions from five to three days and to hold one session each day from 9 a. m. to 1 p. m., instead of two sessions a day as at present.

THE FOREMAN AND HIS MEN.

BY W. L. KELLOGG,

Superintendent of Motive Power and Cars, C., H. & D.

Mr. Kellogg, who has shown a great interest in the work of the association, spoke on the relations which should exist between the foreman and his men, the address being enthusiastically received. He said:

"Your association is too well known and its benefits too thoroughly established to require comment from me on the subject. I will, therefore, confine my remarks to the relations existing between foremen and workmen and their bearing on the cost of output and the peaceful adjustment of wage agreements. Foremen ordinarily come from the ranks of their craft and are representative men. It is true that when elevated to the position of foremen, their dignity should be added to and their loyalty to their employer should be manifest in their every action. This need not, however, raise an inseparable barrier between the foreman and the craft, through learning the rudiments of which he has earned his elevation.

"Nothing speaks so ill for the future success of a newly created foreman as to lose his good-will and respect of his men. To keep their good-will he need not remain one of the boys. The confidence which his superiors placed in him in elevating him to the position carries with it to his associates a certain amount of respect, which in their hearts they feel, although they may not make voluble expression of it. He need not hold himself aloof from the men, but, on the other hand, should join with them so far as possible in expressions of thought on matters concerning their welfare and the welfare of their employer. I have placed their welfare ahead of that of their employers. It perhaps would have been better had I reversed the order, for such must always be the case; the employee can only prosper with his employer. No employer can long continue to benefit his employees unless he himself is prospering. A foreman, as a rule, is better informed on matters pertaining to the welfare of the employer than are the men. Intelligent co-operation between the foreman and the men spells success by the shortest method possible.

"In this day of advancement and enlightenment it is difficult to get men to exert themselves in blind effort. Everyone works toward a goal, be that goal what it may, and I firmly believe that much of the unfortunate agitation, which is sweeping wide over our country, is due to the fact that our men are forced to their task in a blind effort to produce so many pieces of this or that article, with little or no idea of what the results of their labors are, or what the component parts of the material they work upon consist of, or to what future use they will be put. Their goal is one expressed in dollars and cents, with which they are compensated for their production. The workman has little of interest to turn his thoughts to except the increase of his earning capacity. He has little or no love for his work or interest in his profession, and no attachment for his shop, or pride in his organization, and falls an easy prey to the agitator who talks to him of the one goal he knows.

"I believe it is the duty of you gentlemen at your staff meetings to impress this thought upon your subordinate foremen and advise them by every means possible to instil into their men a knowledge of their work, an interest in their output and a pride in their shop and the organization.

"I appreciate that this is a difficult matter, particularly where you have a large foreign element to contend with, but it should never be forgotten that the foreigner of to-day is the American of to-morrow, and that our railways, great as they are, and our American institutions ranking foremost with those of the nations of the world, are the creation of laborers, the great part of which were foreigners a generation past.

"I believe you have only to look to your foremen to convince yourselves that the interest which they take in the welfare of their employers is prompted by motives other than that of the compensation which they receive. I have found this to be the case many times when foremen have volunteered their services for work other than called for by the routine of their occupation and I look back with a great deal of pride to many instances where employees in the rank and file have done the same, but unfortunately must confess that this spirit which has in times past been of such great physical, as well as moral, support seems to be on the decline and I can only attribute it to a growing distance between the workmen and their immediate superiors. If it be admitted that the human interest factor in the output of the hands be pertinent to the increased volume of work, I consider it far more pertinent to the control of the wage situation.

"Nothing is so difficult to combat as the lack of intelligence and the most difficult man we have to handle is the one, who made valuable by his ability to do some one thing well, has grown lopsided in his intellect and believes that his ability as a workman or mechanic leaves him equally able to legislate for himself and his fellow employees in matters economic and politic.

"You all have in your employ broadminded workmen developed both in their arts and craft, and at the same time conversant with their other surroundings. With these men you have little to contend with. Their daily duties are performed systematically and regularly and matters pertaining to their business affairs can be handled amicably and equitably.

"Unfortunately these men are not ordinarily selected by their associates as their leaders and representatives when the question of shop rules or wage schedules are to be discussed. All too frequently you are called upon to receive committees who you well know are not made up of men best qualified to handle such matters for their associates. Often the committee represents the radical element, who after having enjoyed the benefits of their labors for a period and knowing the whys and wherefores of their occupation, and nothing of whether their employers are enjoying a profitable business or not, and having no other idea than personal advancement, regardless of equity, cannot be made to appreciate the unfortunate position in which you yourselves are placed when obliged to decline their requests or demands. I do not mean by this that the private affairs of your company should be scattered broadcast among your employers, but it is right that they should know something of the business in which their energies are expended.

"Your foreman has lost his most valuable asset if he is not able to keep in sufficiently close touch with his men, to act as their counselor or adviser, and exert his influence at all times toward peace and harmony, counseling the men to uniform activity and energy, pointing out to them the possibilities of their future success through the success of their employers, encouraging them in habits of temperance and morality, in the establishment of savings accounts and the building of homes, and counseling them when selecting representatives and leaders to pick conservative men, men qualified to appear for them when meeting their superior officers on matters of mutual interest.

"The success of their craft can well be likened to the success of a nation, our own great country having been built up as the result of physical application of the energies given us. The most successful labor organizations of this country to-day should be pointed out to the men as the ones which have had the most conservative leaders and in which the men have lent themselves to their surroundings and endeavored to advance with their employers, and to the advantage of their employers, and who have not brought disaster on their employers through their endeavors to advance solely at their expense.

"I believe the personal interest feature of your work should be enlarged on at all times. The highest importance should at all times be attached to having foremen keep in closest personal touch with the men under them, displaying an interest in their personal welfare, with elicitude for them in sickness and organizing relief for them in case of need; help-

ing the indifferent workman by endeavoring to get him up to the standard of his more successful associates; singling out the men who will not, or cannot, fit in harmoniously with the balance of the crew and dropping them from the service. They may be valuable elsewhere, if not to you, and it is a mistake, not only for the company and its employers in general, but to the individual as well, to retain a man where he does not fit and where his presence produces discord.

"By this, I do not mean that your shops should be converted into social clubs or benevolent societies, or that all your men should be of one accord or belief. On the contrary, avoid clannishness, which begets narrowness and ignorance of surroundings, which is responsible for the greatest evils with which we have to contend.

"Our mixture of races, who with their varying habits and creeds, producing an enviable rivalry, harmonized and properly guided as necessity arose, has made us the great nation that we are. Our greatest law is equity; our greatest learning, common sense."

GAZETTE COMPETITION.

The announcement made by the secretary that W. G. Reyer, general foreman of the Nashville, Chattanooga & St. Louis, at Nashville, Tenn., had been awarded first prize in the *Railway Age Gazette* competition on "How a Foreman Can Promote Shop Efficiency," was received with much enthusiasm. Mr. Reyer is one of the most active members of the association.

SELF-CLEANING ASHPANS.

BY C. T. WALTERS,
General Foreman, Great Northern, St. Paul, Minn.

There are two styles of ashpans used by the Great Northern—solid bottom and hopper. To clean the solid bottom ashpan, we use, with very good success, what is known as an ashpan swipe, which has been in use on the road for years. The swipe is made of one cast iron column which is placed crosswise in the pan from 4 in. to 6 in. from the front of the pan. Bases are cast on the column 4½ in. apart, and tapped for ½-in. gas pipes. The pipes are screwed into the column and are 4 in., 18 in. and 30 in. long. The number of ½-in. pipes depends on the width of pan. After you have placed the swipe in the pan, cut a hole in the side of the pan to admit a one and one-half inch pipe, which is screwed in the column, and connect it to a 1½-in. cock, which is placed on the side of the firebox from 6 in. to 10 in. above mud ring or in the most convenient place to get at. The handles to open the cock to blow out the pans are in the cab. When necessary to clean the pan open the back damper and then the cock and you have a clean pan. It is not necessary to keep the cock open more than 20 to 30 seconds. This device is used only on the light power.

On the heavy power we use a drop bottom or hopper pan. The doors of the hoppers are connected by levers to a shaft bolted on the engine frame. On the shaft is a lever for opening and closing the doors of the pan. There is a quadrant notched to hold the doors closed. This style of pan is standard on our road, taking the place of the slide bottom pan which was in use for only a short time, as the slides were very hard to open, caused by ashes getting into the grooves. In cold weather the slides would freeze up, causing delays.

Discussion.

The discussion indicated that most of the members used water jets for cleaning shallow ashpans. A number reported the Talmage system as very satisfactory. About 15 seconds are required for the thorough cleaning of pans using this system. Ashpans with slides in the bottom were generally condemned as troublesome in winter, as they freeze tight and are difficult to open. Swinging doors, suspended by links, free themselves more easily and are to be preferred for this reason.

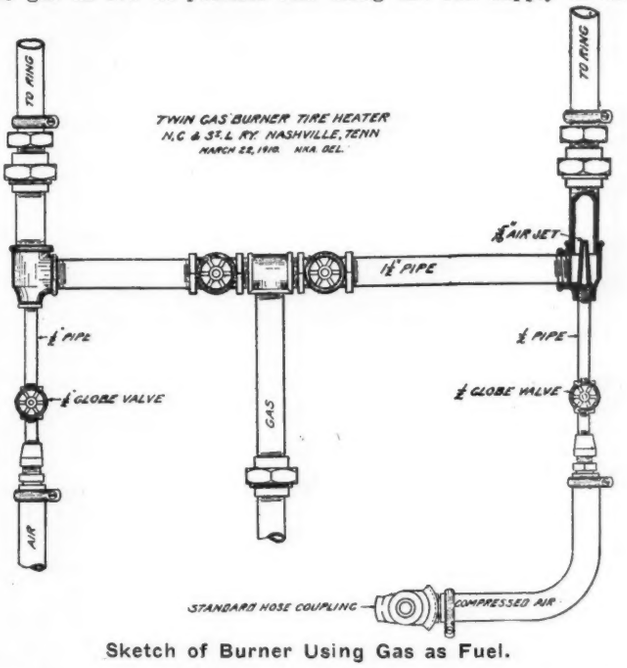
Several members referred to the objection to ashpans which leak; first, because the fine ashes fill up the ballast spaces and prevent proper drainage; second, they are the frequent cause of fires. J. H. Painter (Atlantic Coast Line) said they flanged the hopper door 2½ inches around the edges and the fine ashes formed a seal and prevented leakage. A rim adjustment was not required as the door might not be entirely closed, but the flanged rim would still protect the pan from leakage. Members from northern lines reported considerable trouble from the freezing up when water jets were used. Wm. Hall (C. & N. W.) said they used on large engines two blow-off cocks, one in front of the ashpan and one at the back end and the ashes were blown out with considerable force; this method was satisfactory. Various methods of admitting air were described and for large engines the simplest and most direct was to drop the ashpan as much as 4 inches from the mud ring, thus allowing a larger free air space which would not leak ashes. By placing the ash valve or cover beyond the ashpan, and using properly proportioned jets the pan can be cleaned in less than ½ minute and there is less liability of freezing. To show the force of the water jets ashpans were fitted with bricks and they were cleaned out by the jets in 15 seconds. It is important that in all ashpan designs a sufficient opening be made so that men can get in to repair the grate-shaker connections.

COMMERCIAL GAS AS A FUEL.

I.

BY WM. G. REYER,
General Foreman, N., C. & St. L., Nashville, Tenn.

The drawing shows a gas burner for removing tires. When we first began to use gas, we had a 1-in. pipe with ⅛-in. holes, 1-in. pitch for a 56-in. tire. We used an average of 600 to 700 ft. of gas to a tire, but got better results when we changed the pipe and put the holes in on an angle so they would cover the full width of the tire, and by cutting down the gas as low as possible and using the full supply of air



Sketch of Burner Using Gas as Fuel.

with a ½-in. air supply. We now take off a tire with an average of 275 to 325 ft. of gas. We are using a double pipe, taking off two tires at once, but use about the same amount of gas to the tire, the only difference being the time saved in heating.

We experimented with a double pipe around each wheel, but did not get very good results as the gas could not get around quick enough. It takes about 12 to 20 minutes to remove a tire with gas, according to thickness of tire; we did about the same with gasolene.

II.

BY H. D. KELLEY,
General Foreman, C. & N. W., Chicago.

For the past 18 months we have been using commercial gas as fuel at the Chicago shops of the Chicago & North Western for applying and removing driving wheel tires, babbitting cross heads, babbitting driving boxes, rod brasses and shrinking steel spiders on piston rods. Formerly we used gasolene as fuel. Commercial gas has proven to be much more satisfactory for the following reasons: By always being ready for use. Doing the work much quicker. Being safer to handle. Doing the work cheaper.

Before writing this paper, I made some very extensive tests with both commercial gas and gasolene. The tests were run for about four weeks, first with gasolene, then with commercial gas, applying and removing driving wheel tires, only. With gasolene a large iron tank, holding about 50 gallons, was used. A gage was placed on this tank and graduated to read in gallons. The test was run for 12 days. The time for heating each tire was kept, as well as the amount of gasolene used. At the end of the 12th day, the time for heating the tires was added together and divided by the total number of tires handled, giving the average time per tire for heating. The total gallons of gasolene used in 12 days, was added together and divided by the number of tires heated, thus giving the average gallons per tire.

With commercial gas, a meter was used and the test was

run for 12 days. The time for heating each tire was kept, as well as the amount of gas; at the end of the 12th day the total time was added together and divided by the total number of tires heated, giving the average time per tire for heating. The total cubic feet of gas used in 12 days was added together and divided by the number of tires heated, giving the average number of cubic feet per tire. With both commercial gas and gasolene, I took the inside diameter of the tire, in inches, and added them together for each test, and divided the number of inches into the amount of gas or gasolene used, getting the cost per inch of diameter for both tests. This, I think, gave me a good comparison between gas and gasolene.

The following table gives the time and cost per average tire, or better still, the actual cost per inch of diameter for heating locomotive tires: Gasolene at $0.10 per gallon. Commercial gas at $0.85 per 1,000 cubic feet.

Inside diam. of tire.	Gasolene.	Commercial gas.
42 in.	$0.1365	$0.1143
44 "	.1431	.1191
46 "	.1495	.1251
52 "	.1690	.1415
56 "	.1920	.1523
62 "	.2015	.1689
68 "	.2210	.1850
74 "	.2405	.2013
Average time, per tire	17.52 min.	15.5 min.
Average cost per tire	$0.175	$0.1433
Av'ge cost per diameter, inch	.00325	.00272

In this test commercial gas showed a saving of about 16 per cent.

Discussion.

W. G. Reyer (N. C. & St. L.):—A man was talking to me who advocated the use of coal oil. He said he got better results. He has a system of coil pipes that generate a gas. If we use only 10,000 feet of gas a month it costs $1.00. I do not think you will find commercial gas any cheaper than gasolene, though it is safer. The coal oil burner is much safer, better and cheaper.

W. Smith (B. & O.):—At our station we use crude oil for running repair work and changing tires, but we think gasolene is much more satisfactory. It doesn't flame up so high and there isn't so much trouble in burning running boards and cabs as with crude oil.

C. L. Dickert (Central of Georgia): We have tried gas, gasolene and coal oil. First we used gas; then we went to gasolene and had an explosion, and now we use coal oil very satisfactorily. We use a home made heater and a ring, but instead of drilling holes in it we saw it with a hack saw about every 2½ in. It makes a much better burner.

Mr. Smith: We get better results by mixing carbon oil with the crude oil—a little less carbon oil than crude oil.

President Ogden: In my experience in using carbon oil, if we did not thin it with fuel oil there was too much carbon, and we were unable to keep the holes in the pipe cleaned out long enough to heat a tire.

W. C. Groening (Pere Marquette): At the shops at Grand Rapids we cannot get gas, but we use 87 deg. gasolene. It affords a better gas, is a quicker heater and gives better results. With a common gasolene there is a blazing, but with the 87 test we get a good blaze and intense heat. What test gasolene did Mr. Kelley use?

Mr. Kelley: It was 68.

C. H. Voges (C., C., C. & St. L.): I saw a demonstration in the Collinwood shops. They have a 2-in. pipe with ⅜-in. holes, and it makes an intense heat. They use a combustion chamber. They put a 3½-in. tire, 72 in. in diameter, on in 21 minutes. We have been using gasolene for the last five or six years and it has given good satisfaction.

H. M. Brown (C. & O.): At the shop where I am located we have not had an opportunity of using gas for heating a tire, but use 150 deg. oil. With the class of labor that we employ to take off a tire and put it on, it is absolutely safe and very satisfactory. We have never used gasolene on account of explosions. We also use the same burner for preheating frames for thermit welding, or for a tank frame that may be bent. With 150 deg. oil a higher heat can be obtained than with gasolene that is low of specific gravity.

ORGANIZATION AND SYSTEM.

F. C. Pickard, master mechanic of the C., H. & D., upon being elected a member of the association, said:

"You must not build a fence around you so that you cannot be approached at any time. The master mechanic or the general foreman cannot be the whole thing. You may have a strong leader but he cannot do it all. He is simply the pivot which the organization swings around. Each individual forms a cog in the gear wheel. If one is missing the whole part goes roughly. Whenever a man gets it into his head that his shop is all right; that his organization is all right, he is the wrong fellow. He is a back number. You can go away and stay for thirty days and when you come back you will find some changes.

"Another important function in connection with your duties is to watch the despatch of power, especially at the present time when we have more business than we can take care of. Every hour an engine is around a terminal means something.

"We have a system in our shop known as the card index system. We know each and every engine that is coming into the shop 30, 60 or 90 days in advance. Each foreman consults it and sees what is necessary and confers with the storekeeper so as to have his material on hand. Our shop was built in 1879 and is classed as a back number. Last month we took an engine in on April 11 and on the 19th we turned it out of the shop and it went into service on the 20th. It received a new set of driving boxes, shoes and wedges, and a firebox. We built an extra back end for the boiler. This we are doing for every class of engine we have on our system. This matter was lined up in one of our staff meetings with the storekeeper, and when the engine arrived on the pit each man had his part to look after. We had a flat car with a new firebox end on it, and it was placed behind the engine, one end of the car being empty. The other box was cut off on Tuesday morning, taken out to the turntable and pushed on the flat car which was turned, pushed back in and the other end put on the boiler. The jaws were faced on Monday and the shoes and wedges laid off on Tuesday. In order to get out of the way of the machinist, the blacksmith had to make two welds on the frames. We put him at that Monday evening. By planning and lining up these things we got wonderful results."

ADVISABILITY OF INSTALLING A HOT WATER WASHOUT AND FILLING SYSTEM.

I.

BY C. H. VOGER,
General Foreman, C., C., C. & St. L., Bellefontaine, Ohio.

The National hot-water locomotive boiler washing and filling system was installed and placed in operation at the Bellefontaine roundhouse in December, 1909. It is equipped with two Dean duplex pumps 12x8½x12 in.; the capacity of the filling pump is 500 gallons per minute; the washout pump will wash three boilers at a time with a pressure of 90 lbs. The filling storage tank has a capacity of 12,000 gallons, and the washout tank a capacity of 85,000 gallons.

In the operation of the system, the steam and water are blown out of the locomotive through a blow-off line between the pits and into a filter in the washout tank. In this filter the steam and water strike a baffle plate, where the steam is separated from the water; it then rises and passes through the blow-out steam pipe into an open heater on the filling tank. The steam and water passing to the filter opens a flop valve, which is connected to the fresh water line valve. This heats the cold water, automatically admitted by the blow-off steam and water, and in a sufficient quantity to refill the boiler. The heated water follows from the open heater to the storage tank for filling purposes. A thermostat is placed in the storage filling tank and controls a live steam valve, which is opened when the temperature of the filling water is below the desired temperature. In connection with the filling tank there is a float valve for the purpose of controlling the admission of fresh water to the filling tank when the level of the water falls below a certain point. In this manner we always have a minimum amount of water for filling purposes.

It takes 1 hour 56 minutes to wash and fill a boiler, including the cooling of the boiler and letting out of the water. You can wash a boiler quicker than this, but I doubt if you can do it right. The water in the washout tank is ordinarily about 185 deg. Fahr., being regulated by a valve on the cold water line. This valve is actuated by a thermostat inserted in the tee in the suction line, the thermostat assuring a positive temperature of the washout water. The filling water is ordinarily about 190 to 200 degrees Fahr.

This plant saves water, saves fuel, removes the mud and scale in the boiler before it gets baked, and saves leaky flues.

II.

BY C. L. DICKERT.
General Foreman, Central of Georgia, Macon, Ga.

The time consumed for our washing system at Macon, Ga., using the plant installed by the National Boiler Washing Co., Chicago, is as follows:

Washing Broad Firebox Consolidation, 1700 Class, 22 x 30 in.	
Coupling blow-off hose	3 min.
Blowing off boiler, 50 lbs. steam, 2 gages water	40 "
Removing 22 mud plugs	15 "
Washing boiler	20 "
Putting in mud plugs	7 "
Filling boiler, 1 gage water	14 "
Getting 50 lbs. steam	30 "
Total, 2 hrs. and 9 min., or	129 min.

Washing Narrow Firebox Consolidation, 1030 Class, 21 x 32 in.

Coupling hose	3 min.
Blowing off boiler, 90 lbs. steam, 1 gage water	42 "
Removing 18 mud plugs	16 "
Washing boiler	31 "
Putting in plugs	12 "
Filling boiler	7 "
Getting 50 lbs. steam	34 "
Total, 2 hrs. and 25 min., or	145 min.

This class of boiler is the most difficult we have to wash.

Small 1500 Class Engines, 18 x 24 in.

Coupling hose	4 min.
Blowing off boiler	18 "
Removing plugs	11 "
Washing boiler	9 "
Putting in plugs	3 "
Filling boiler	5 "
Getting 50 lbs. steam	23 "
Total, 2 hr. and 13 min., or	73 min.

Temperature—Washing, 150 deg.; filling, 200 deg.

System of Washing in All Cases.

1. Crown sheet.
2. Flues at front end near checks.
3. Belly of boiler and bottom flues from front end of boiler toward firebox.
4. Back head, above and below fire door.
5. Sides.
6. Throat and back flue sheets.
7. Arch pipes.

Washing water, 140 lbs. pressure; filling water, 180 lbs. pressure.

Discussion.

Mr. Kelley: We have the hot water system for washing boilers in Chicago. Our average time turning engines with the hot water system is not much quicker than it was with cold; about 2½ hours from the time the engine gets in the roundhouse. It does save considerable leaky flues and stay-bolts.

W. Smith (B. & O.): A previous speaker said that very little time is saved in washing out the boilers with hot water. If a boiler is filled with hot water it requires 35 minutes to get steam up. With the very best fires possible it takes at least an hour on the heavy engines, and we are fortunate if we can make it in that time with cold water.

Mr. Kelley: The gentleman probably misunderstood me in regard to the saving. There is a saving, but the prime object in installing the system is to save the boiler from failure on the road.

Mr. Reyer: Before we installed the hot water system, when we blew an engine out steam would be all over the roundhouse; but now we see no steam at all. Men can work on any part of the engine while it is being emptied. The boilermaker tells me that there is a decided improvement on the boilers.

Mr. Dickert: We have less trouble with boiler failures since we began using the system. Our boilermakers were on a strike for six weeks and we did not have a delay on account of a boiler failure.

A. L. Ball (C., I. & S.): There is a big advantage in using the hot water system. If you take an engine off of the road and draw the fire out and have the arch brick hot, it is almost impossible to put the cold water in it. If you cool the arch brick down you crack the brick.

President Ogden: If we did not have a hot water system on the Santa Fe we would be almost tied up. We could not turn the power fast enough. It saves time and it saves fireboxes. The large engines on the coast lines take from 8 to 10 hours to cool.

A motion was carried to the effect that it was the sense of the meeting that the hot water washout system is a great improvement over washing out with cold water.

OXY-ACETYLENE WELDING.

I.

J. M. DAVIS,
General Foreman Colorado & Southern Denver, Col.

The pressure of the oxygen in the hose leading to the burner or torch is 25 lbs. per square inch. We use acetylene under a pressure of 6 lbs.; this will weld all metals except cast iron, and when that is to be welded there should be about 9 lbs. pressure, but not more. We use a small Monarch air hammer with a diamond point chisel for cutting out and following up the crack. We use strips of ¼ in. boiler steel for welding in cast steel, such as car truck frames and bolsters, and in fact all mild steel or boiler sheets in fireboxes. In welding cast iron I have stick castings made ⅛ in. x 12 in. long. These are of as mild or soft a cast iron as possible.

II.

BY W. T. LAUER,
General Foreman, Erie Railroad, Huntington, Ind.

In my opinion, the process when fully developed in the United States will be better than that in France and Germany, where it is already past the experimental stage and is being used in applying new sections of boilers with a great deal of success. I have seen considerable small welding of cast-iron and steel, such as automobile cases, large water pump castings, excentric blades and other small castings, where apparently the work was done very successfully. The process is also being used successively in cutting channels and all other classes of iron.

In boiler work, it is undoubtedly in an experimental stage. However, the results obtained are very gratifying, although the successful handling depends almost entirely upon the operator, who must be thoroughly conversant with his apparatus and must have sufficient knowledge of boilers to overcome (by annealing and pre-heating the plates in the vicinity of the weld) the strains set up by the action of the metal at different temperatures.

I also find that free end patch welding is being done successfully in practically all cases, but that oval, round or rectangular patches that require welding on all sides cannot always be figured out successfully, and that welding a patch of this description is just as liable to be a failure as it is to be a success. Furthermore, I find that satisfactory results are being obtained in building up wasted corners, also welding up small cracks in the knuckle of flue sheets; where this work has been done, engines have been running several months without leakage.

Discussion.

Mr. Kelley: I have had experience with acetylene welding; some of it has not been very successful. I have tried to weld up cracks in main rods and side rods, tongues and shafts; tried some boiler welds and cranks on motion valve gear. I have also had the representatives of the different firms call on me and tell me what they could do; but I would like to have them do it. It is certainly a wonderful process and in time will develop into something. In a large piece of iron the important thing is to take care of the expansion and contraction. We have to keep it hot. We have a great many frames broken on our big power, and it would certainly be a saving if we could get at the frame and weld it without dismantling the engine. I have repeatedly asked the representatives to come around to my place and do the welding for me, but none of them have as yet tackled the job. In welding small pieces such as cast iron, wrought iron or steel, we are rather successful, but in going into the heavy pieces of iron you have to preheat it, but how long can you keep it that way? A man cannot stand over a fire and weld anything with a torch. The metal that goes in must be at about 2,500 deg. It is certainly expanded to about its limit. It draws in and draws away from the other portion of the iron when it cools.

Mr. Reyer: I have a small oxy-acetylene plant, and what success we have had with it I attribute to the foreman boilermaker. We have been able to weld crossheads, fire door frames, side sheets and put patches on the firebox, etc. We had trouble at first with our patches in the firebox, and I am willing to admit that the first one or two engines came back to us. You have to take care of the expansion and contraction if you ever make a success. A great deal depends upon how the operator handles it. We have never been able to make a satisfactory weld in anything that is cylindrical in shape. We made a weld, but when it cooled off it cracked worse than before. These experts tell us what they can do, but they have never been able to do it for us. We have never attempted to weld a frame, but we have welded links with success. We attempted to weld some rocker arms, but found we were on the wrong track and stopped it. It only welds through the surface and is dangerous. The firebox proposition is a great saving. It costs about half. The patch has to be applied in such a way that the expansion and contraction is taken care of. The operator must take time enough to make a thorough weld. If you taper the edges back too much you will get a failure. The short taper will do better.

R. V. Wright (*Railway Age Gazette*): The Elizabethport shops of the Central of New Jersey have been doing successful thermit welding on frames for several years. They pre-heat and get splendid results, not only on frames but on much more difficult work. They are repairing spokes on driving wheels. A great many have tried this with poor results because they do not pre-heat properly.

Secretary Bryan: We have used thermit for welding frames. In fact that is all we use it for. We have welded in the neighborhood of 75 or 80 of these, and have never had but one failure, and that was on account of its not being properly heated.

Mr. Boyden: We are using thermit on the Erie and have had one failure. That was due to the fact that the frame was not properly pre-heated. We average ten or twelve a month. These welds are made by an apprentice with the aid of a helper.

SUPERHEATERS.

BY A. L. BALL,
General Foreman, C. & I. S., Kankakee, Ill.

In the last 25 years, steam pressures on locomotive boilers have been gradually increased from 140 to 225 lbs. working pressure. The result has been that the cost of boiler repairs has been very much increased on account of the decreased life of firebox, staybolts and flues. Superheating affords a convenient means of adding heat to steam without increasing its pressure; also the advantage to be obtained by enlarged cylinders. There is no question but that considerable economy is obtained by the use of superheated steam, preferably of reduced pressure, say of 160 pounds, to avoid excessive boiler repairs. This is especially desirable in bad water districts, and it is possible to effect considerable economy in this direction. The smokebox type of superheater develops a low superheat of 25 to 50 deg. F. The single loop fire tube superheater a moderate superheat of 100 to 125 deg. F. The double loop fire tube a high superheat of 175 to 250 deg. F.

Saturated steam at 160 lbs. has a temperature of 370 deg., at 200 lbs. 388 deg. and at 225, 397 deg., or an increase in heat of about 27 deg. for practically the entire range of pressures in locomotive practice.

The low degree of superheat as afforded by the smokebox superheater adds 35 to 40 deg., which is more than can be obtained by means of high pressures.

Moderate and high superheat, on the other hand, affords a convenient and practical means of adding from 100 to 250 deg. of heat. When superheated steam has received, say 175 deg. of additional heat after removal from contact with the water, it is found that 175 deg. of heat can be extracted at a constant pressure before it reaches the saturation point. Therefore, its expansion will partake of the properties of gas and the loss due to the condensation and re-evaporation of the cylinder walls will be largely avoided.

If the superheat is high enough to supply not only the heat absorbed by the cylinder walls, but also the heat equivalent of the work done during the expansion, then the steam will be dry and saturated at release. The firebox temperatures in locomotives must be at least 1800 to 2200 deg. The smokebox temperatures will range from about 550 to 700 deg.

Tests made on superheaters show a saving of 12 to 20 per cent. in fuel and a saving in water of 15 to 25 per cent., it being larger because more fuel is required for the production of one pound of superheat than for the same quantity of saturated steam.

In order to obtain 150 to 175 deg. of superheat and over, it is necessary to resort to the fire tube form of superheater, as it is not possible by any designs of smokebox superheaters to get sufficiently high temperatures in the smokebox without using a large 10 or 12-in. flue in the bottom of the boiler, as in Schmidt's earlier designs. The use of these large flues have been abandoned, even by Schmidt, on account of the extra cost of installation and maintenance, and practically all the designs recently equipped with the Schmidt system have used the fire tube style.

One disadvantage of the smokebox type is that the entire extra weight is concentrated at the front end in a line approximating the vertical center of cylinders. This means with a four-wheel leading truck that all the extra weight is practically added to the truck. On the other hand, the fire tube type distributes the weight much more uniformly.

The Germans have abandoned the smokebox type in favor of the fire tube, chiefly on account of the concentration of weight at the front end, the extra cost and the necessity of using a large tube to raise the temperature of the smokebox gases. Furthermore, they attach much importance to the greater simplicity, ease of application and dismantling; and they state that these advantages have proven of such practical value that for all new locomotives the fire tube type is being used at the present time.

While at a first glance the smokebox type may appear to possess some attractive features, especially in the utilization of the waste heat in the smokebox gases, in practice it is found impossible to obtain more than a few degrees of superheat without increasing the diameter of the boiler tubes, as the temperature of the smokebox gases is not sufficiently high to impart more than 25 to 35 deg. over the normal temperature of the saturated steam in the boiler. It is, therefore, practically little better than a drier and the economics in fuel and water which may be obtained are insignificant as compared with the use of superheated steam of 200 to 250 deg.

It is probable that the trials made in the West with the smokebox superheater are largely in bad water districts where on account of boiler foaming an abnormal amount of water is carried to the cylinders. It is, therefore, possible that in the East where these conditions do not exist to the same extent that the relative economy would be very much less.

The economy in water and coal increases very rapidly with the higher temperatures, and with 150 to 200 deg. of superheat, a conservative estimate of the saving in coal is 20 per cent. and in water 25 per cent.

At the present time the application of superheaters to locomotives constitutes the most attractive and practical forms of improving their power and efficiency. The cylinders can be enlarged to permit greater ratios of expansion, economy of water and fuel and the use of lighter engines which will develop a greater amount of horse-power per unit of weight than is possible with the saturated steam locomotive.

About the only additional care required in the operation of locomotives supplied with superheaters capable of heating the steam to high temperatures, is blowing out the flues after each trip to remove accumulation of soot and cinders. This, however, is the regular practice on some roads with saturated steam locomotives and probably well repays the slight extra cost on account of the better conductive qualities of the tubes when they are in a clean condition.

One of the claims made in favor of the smokebox type is that it is better adapted for application to old locomotives in which it is desirable to reduce the pressure. The principal difference in cost is the renewal of the tube sheets required with the fire tube type, but in case the firebox was worn out or if engines selected for the application of superheaters required new firebox tube sheets there would be practically no difference in the cost of application.

To renew the boiler tubes requires dismantling of the smokebox type of superheater, as usually constructed, but most of the small flues can be removed, especially those in the bottom of the boiler in the later form of fire tube type without dismantling the superheating apparatus.

The superheating tubes in the smokebox type seem to be exposed to a great deal more cutting action from the cinders, as they are at right angles to flues and the gases, than the fire tube type, which would make them very short lived.

The higher degree of superheat, the more the diameter of the cylinders can be increased over the normal dimensions, and consequently increase the starting power, and greater ratios of expansion can be obtained for certain types of engines within the limits of suitable factors of adhesion.

The most economical results with the fire tube type are obtained with a superheat of 180 to 280 deg., with boiler pressure of 160 lbs., the temperature of the saturated steam is 370 deg. and the temperature of the superheated steam at the figures named would be 550 to 650 deg. With suitable design of piston valve and proper lubrication no special difficulty has been experienced in actual operation.

For a superheat of 200 deg. the increase in volume is approximately 25 per cent., so that with the safe cut-off the weight of steam required is 25 per cent. less than with saturated steam with the same pressure. Generally the cut-off can be decreased with superheated steam so that additional economy is obtained by the greater ratio of expansion, which added to the fact that superheated steam does not condense until it has given up all its superheat adds still further to its economy.

As the limits of tractive power at medium and high speeds is largely a question of the ability of the boiler to generate sufficient steam, it will be apparent that a locomotive capable of developing the same tractive power with 80 per cent. of the normal consumption of fuel will show a large increase in tractive power assuming the same amount of coal per hour is burned as in a saturated steam locomotive. This increase under favorable conditions may amount to 30 or 33 per cent.

VICE-PRESIDENT BOYDEN'S ADDRESS.

Mr. Pickard spoke this morning of the expense of a mechanic walking from the locomotive to the store room. We have a system in Cleveland known as the material delivery gang system; it consists of a foreman at $60 a month, two assistants at 17 cents an hour, four helpers at 13½ cents an hour, and one messenger boy at 10 cents an hour. We do not allow a mechanic or helper to go to the storeroom. We have twelve miles of industrial track around our plant. A foreman must anticipate his wants 30 minutes in advance, with the exception of the roundhouse foreman, where there is a 10-minute delivery. A foreman may want 12 nuts delivered to engine 1250. At intervals through our plant we have little red boxes. He makes out his order and puts it in one of these. The messenger boy takes it up and the material is delivered to the engine, or wherever it is to be used. It costs us on an average of 2⅓ cents per order. I think if the general foremen would do this they would find a great saving. A good many of the laborers we have are foreigners, and when they went to the storeroom did not know what they wanted.

In the morning we make every man go to the tool room and draw the necessary tools for the job he left the night before. He is not allowed to go to the tool room again before night. We have the same system in the machine shop. We have one boy who takes back all the tools that the mechanic is through with and sees to the drawing of new tools. I would like to know what experience you have had in getting the tools in at night. We had a lot of trouble with the jacks. They got in the roundhouse and were not returned the next day. If a man draws a jack to-day and it is not in the tool room when he quits, he loses an hour the next day. When it hits their pocketbooks they are a little more careful.

I told Mr. Reyer that we got 8 engines out with 6 machinists on the floor. He did not believe me. I would be glad to have any of you come and see. I do not say I do it every month. We work piecework and have 8 pits, and every pit has a drop. There are two handy men who dismantle the engine with the exception of the ashpans, front ends and pipe work. There is a handy man in the boiler department who takes care of the ashpans. Besides the 6 machinists on the floor, we have 3 handy men. Another man is what we call a roust-about. In our motion work the man that handles the links completes the job and sets the valves. The rods are taken down by the handy man and delivered to the fitting shop; the cab mountings are handled in the same way. There is a machinist on the floor that puts the cab work up, but he does not overhaul it. There is mighty little left for the six men on the floor.

There is no system like piece work with the class of men we are getting to-day. You get up here and say you have 200 machinists. What do you do with them? You are spending a lot of money in looking after those machinists, but when you put the men on piecework you do not have to do so. We have an assistant general foreman who times all new operations. The men get so that the minute they get hold of a new job they look him up and say: "Come and time the new job that I have." We have never cut the price in Cleveland with the exception of where the company has spent money in buying new tools.

We endeavor to be fair to the men and fair to the company. We do not work piecework on a job until the piecework schedule has been signed by five men—the assistant general foreman, the general foreman, the master mechanic, the shop specialist and the mechanical superintendent. And the price cannot be changed without the consent of the five people that signed the cards. The prices are there so that the men can read them just as well as the foreman. I do not know of a place where the price has been cut for three years.

Another thing in handling men, the general foreman should watch the language used by the foremen among their men. We hold a meeting with the representatives of each one of our departments the first Monday of every month. It is held in my office. All foremen are barred. These representatives get the grievances of all the men if they have any. Our first question is what they have for the betterment of the service. After we have gone through that we ask each individual what personal grievance he may have, and it would surprise you to know what we get through these meetings. They are well worth holding.

THE WIDE FIRE BOX.

I.

BY C. BOWERSOX,
General Foreman, T., St. L. & W., Frankfort, Ind.

The Toledo, St. Louis & Western has 30 locomotives with wide fireboxes, and it is not an unusual thing for the boiler foreman to hold an engine for a patch or a few staybolts just when you want a power most. While we have eliminated our staybolt trouble to a certain extent by applying the flexible staybolt, nothing has been found to stop the cracking of the firebox sheets.

We have 10 engines with the narrow firebox, carrying 200 lbs. of steam, the same pressure as carried by the engines with the wide firebox. These engines have been in service for seven years without a patch in the firebox, while the thirty engines with the wide fireboxes have each had from one to four patches. The majority of our boiler failures are on engines equipped with the wide firebox; they cannot be cooled down without starting the flues to leaking. The cost of maintenance of the wide firebox is more than double that of the narrow firebox. During last year we renewed 492 staybolts in 10 of the large engines with the narrow firebox, and 1,925 staybolts in 10 of the large engines with the wide firebox, nearly four times as many. A narrow firebox engine coming off the cinder pit does not require nearly as much attention as one of the wide firebox engines. There is but very little difference in the fuel and water consumption betwen the two classes.

II.

BY C. H. VOGES,
General Foreman, C., C., C. & St. L., Bellefontaine, Ohio.

The wide firebox gives a more equal expansion, is more easily kept clean and has less leaky and broken staybolts. After the narrow firebox is in service six or eight months the flanges of the back flue sheet check from the rivet holes to the caulking edge, making it necessary to hold the engine in, remove rivets, scarf sheet and rerivet or apply patch bolts or plugs. In the wide firebox the flanges are rarely found with fire checks. The wide firebox has a greater grate area and it is easier to draft an engine to make it burn an even fire. It is also much easier for the fireman, on account of the distance he has to shovel the coal, to keep a good fire against the flue sheet, causing less failures on account of flues leaking.

In the wide firebox with the side sheets almost straight, it is practically impossible for scale to lodge on staybolts, but it will drop from any part of the boiler over the firebox to the water bar, where it can be easly washed out; in the narrow firebox when the heavy scale becomes detached, it will in nine times out of ten lodge on the staybolts, causing mud to form, and if allowed to remain, the side sheets will become mud burned and crack, making it necessary to take the engine out of service to plug cracks or patch.

Widening the water leg to prevent the side sheets from cracking, in my opinion, would result in a failure, as the water would bubble away from the side sheets with a ⅛-in. water leg the same as from a 4-in. leg. We have had engines in both freight and passenger service for four and five years with the wide firebox that have no checks in the firebox; on the other hand, the engines doing the same service with the narrow firebox, will, in three or four years' time, have received half side sheets or will have several patches on them. To overcome the cracking of side sheets keep the boilers clean. The only way to do this is to make the roundhouse boilermaker responsible for the boiler washing. When he sees the good results and the manner in which it lightens his work on fireboxes, he will not allow the boilers to go out half washed, but will take time to see that they are washed thoroughly and the cracking of side sheets will be reduced about 40 per cent.

I would recommend two rows of flexible staybolts above the horizontal seam, on account of the rigidity of this part. We discovered more broken staybolts at this point than any other place; 223 broken staybolts were removed on the high pressure boilers in one year. In five years' time we removed 2,200 caps to test the flexible staybolts and found only three bolts broken.

III.

BY H. O. OLSON,
Foreman Machine Shop, D. & I. R. R.R. Co., Two Harbors, Minn.

When comparing the two types of fireboxes it is important that the locomotives shall be used under the same conditions, and be the same size. As a general rule, the engines with the wide firebox are much heavier and are expected to handle a greater tonnage. Long before locomotives had reached their present enormous size and power, it was found that the old style of narrow firebox would not give sufficient grate area for what was supposed to be the economical combustion of fuel. It was not considered economical to burn coal at a higher rate of combustion than 75 lbs. per hour per sq. ft. of grate surface. That this idea is no longer universal is shown from the fact that narrow fireboxes burning 180 lbs. of coal per square foot of grate area are considered economical by some. This is made possible on account of being able to maintain a deep fire in the deep narrow fireboxes so that there is little chance for an excess of air to get through the bed of fuel and decrease the efficiency of combustion. But there is no doubt in my mind that a wide firebox gives better results in fuel economy than the narrow on account of the greater grate area compared with the heating surface than can be had with the narrow, providing the wide firebox is deep enough so that a good body of fire can be maintained at all times. A wide firebox of the same depth in front of the toboggan firebox, or not less than 36 in. under the flues is not an impossibility and would probably give better results from a firing standpoint and also cost less to keep in repair, but if the wide firebox is too shallow it may not be economical in fuel on account of holes being torn in the fire and too much cold air being admitted, reducing the temperature of the gases and interfering with proper combustion. In this case, there is no question but that the cost of repairs is greater, caused by the thin fire allowing the cold air to come in contact with

the flues and side sheets, causing leaks and cracks due to the variation in expansion and contraction.

As a general rule engines with wide fireboxes are much heavier and handle a larger tonnage which apparently increases the cost of repairs. This should be considered in comparing the wide with the narrow fireboxes and the repairs and also the fuel should be figured on the tonnage basis. On the Duluth & Iron Range road we have engines with both the narrow and the wide firebox, and those with the wide firebox have required more repairs than those with the narrow, although they have shown better fuel economy. This saving of fuel will more than pay for the extra expense of repairs, especially if the cost is figured on the ton-mile basis.

Discussion.

Mr. Kelley: The wide firebox is *the* firebox, and most railways are buying it. We have had less trouble with the narrow box than we had with the wide firebox due to more than one reason. The wide firebox is in heavy service, kept out on the road, and the narrow box, as a rule, is in light service. The last paper read mentioned the number of staybolts breaking. That is probably due to construction more than anything else.

One of the papers was in favor of flexible staybolts. They may be good things, but I know of no reason at the present time for applying a flexible staybolt. Recently we had trouble with staybolts breaking on one of our larger engines, but found that it was due to the faulty construction of the firebox.

The cracking of sidesheets can be partially remedied by corrugating the sidesheets. We corrugate all our sidesheets. The sheets do not crack where we can wash our boilers properly.

The writer of one of the papers was not in favor of the wide leg on the firebox. I think we ought not to go to an excessive width, but the wide leg is a good thing. It gives a better chance for circulation and there is not so much chance to clog. You can clean it better and get better results. A narrow firebox that sets down between the frames with the O. G. shape gives practically no trouble where the boiler is kept clean.

An engine was delivered to our system along in the latter part of 1888. On one side of the firebox we have removed the sidesheets four or five times; the other side has the original sheets. On neither side of this boiler did we find at any time excessive mud. The engine was on a good run and was in fairly good condition.

I have another engine in mind which was exhibited at the Columbian Exposition in Chicago. It has been running ever since with the original sidesheets. It uses about 180 lbs. of steam, and has been running with practically no broken staybolts. It is a deep narrow firebox.

I believe it is conceded by mechanical men throughout the country that high pressure is not a good think for boilers, and lowering the pressure will eliminate some of the trouble. Many of the roads are cutting down the steam pressure and increasing the cylinder diameter, which gives the same power and does away with many boiler troubles. Many say that we ought to drop the steam pressure below 180 lbs., and some roads have cut it to 170 lbs. for the new power, especially freight power, and up to this time with good results.

Mr. Reyer: We have three classes of fireboxes: Narrow, intermediate and wide. As far as the life of the sidesheets and fireboxes is concerned, we find that the narrow firebox lasts much longer. We have had them last as long as thirty years. The intermediate gives us the next best life, and the wide firebox the shortest life. We have had to remove them after from four years to eight years. Much depends on the steam pressure. The higher the pressure the shorter the life. We are using flexible staybolts in wide fireboxes. The power should be handled carefully at the cinder pit in order to insure longer life and get the best results from an engine.

Mr. Kelley: A great deal of our boiler trouble is due to the handling of the engine. I can take an engine off of a run, put it over the cinder pit and handle it so roughly that when it goes to the roundhouse it will leak like a sieve. If it goes out on the road there will be an engine failure. This is due to allowing the cold air to rush in when it is over the pit. The hostler pulls the throttle right open, drawing fresh air through the flues. That is where a great deal of the boiler troubles start. It is man failure and not an engine failure.

Mr. Buckingham: In my experience, I find that the first thing a hostler does is to put on the blower, put in a big fire and put on the injector. I have a flat rule that no hostler can put water in a boiler unless he has fire in it. We have a rule that the air pump should be shut off when cleaning a fire; that is, the blower should just be cracked, just enough to pull the gas.

Mr. Reyer: About the handling of engines on the pit; our roundhouse is about two miles from the terminal station. The engineer makes the report out and the engine is turned over to the hostler. The cinder pit men have strict orders just to crack the blower, but we have to watch them very closely or they turn the blower on and fill the boiler up. We have had as many as 100 flues leaking, when the engine came in absolutely tight. I think it was wholly due to the cold air causing the contraction of the metal.

Mr. Motta:—We have had very little trouble with the wide firebox. We use oil for fuel, so we have very little trouble on the cinder pit.

Mr. Smith:—A wide firebox is generally conceded to be 10 per cent. more economical than a narrow one. My experience has been that the wide firebox will run with a bigger nozzle than a narrow box will. A wide firebox engine, when on a siding for a few hours, consumes more coal than a narrow firebox under similar conditions. This is easily compensated for when the engine is in service.

ELECTION OF OFFICERS.

C. H. Voges, general foreman of the Big Four at Bellefontaine, Ohio, was elected president; T. F. Griffin, general foreman of the Big Four at Indianapolis, Ind., first vice-president; J. A. Boyden, general foreman of the Erie at Cleveland, Ohio, second vice-president; E. A. Murray, master mechanic of the C. & O., Lexington, Ky., third vice-president; H. D. Kelley, general foreman of the C. & N. W. at Chicago, fourth vice-president; L. H. Bryan, general foreman of the D. & I. R. at Two Harbors, Minn., secretary-treasurer. The following were elected members of the executive committee in addition to T. J. Finerty of the International & Great Northern and L. H. Bryan of the D. & I. R., whose terms have not yet expired: E. F. Fay, Union Pacific, Cheyenne, Wyo.; F. C. Pickard, master mechanic, C., H. & D., Indianapolis, Ind.; Wm. Hall, C. & N. W., Escanaba, Mich.

Secretary Bryan: The *Railway Age Gazette* has sent representatives to our convention at great expense and has held its forms open until Saturday in order to publish promptly all the details of this convention. That is something that has never been done for any other organization by that paper. This enterprise on its part in order to get all the news and minutes of the convention before the mechanical people should be appreciated by our members.

Mr. Ball: I move that the *Railway Age Gazette* be extended a vote of thanks for their courtesy in publishing our proceedings so fully.

The motion was seconded by several members and carried unanimously.

LOCATION OF POINT OF WATER DELIVERY TO LOCOMOTIVES.

I.

BY H. M. BROWN,

Assistant M. M., Chesapeake & Ohio, Hinton, W. Va.

If it were possible to feed an ordinary locomotive boiler with an injector with water under high temperature, it would not make much difference where the water was delivered into the boiler; but as it is not possible to get satisfactory work out of an injector with water at a temperature much above 100 deg. F., it is best, I believe, to deliver it at a point as far removed from the firebox as is possible, and high up, if not on top of the boiler. The old, and generally accepted, practice of introducing the feed water into the boiler below the high water level, still prevails, although in some cases, the water is introduced into the steam space of the boiler, particularly where check valves of the Phillips pattern are used on top of the boiler.

We have applied the above mentioned type of boiler check to a number of locomotives on our road on top of the boiler and as close as possible to the front flue sheet. This is, in our opinion, the best point of water delivery, because the water enters into the steam space of the boiler and, passing through such a high temperature, is heated to a much higher degree than is otherwise the case, thus preventing, to a great extent, the difference of temperatures at various points on the boiler plates.

This avoids the injurious effects of expansion and contraction to a much greater degree than if the water was delivered at, or near, the bottom of the water space of the boiler. This has been satisfactorily proven by the use of the Phillips check and a material saving in the consumption of coal has been effected. That the old practice has been retained for such a long time, is probably due to the mistaken idea that the injector will not work properly if the delivery is connected to the steam space of the boiler.

The principal advantage claimed for the Phillips check is that it is not connected with the water and is thus not likely

to corrode easily, calling for less frequent repairing; it will also remain in good working condition much longer without regrinding or resetting, materially reducing the cost of maintenance. Should it become necessary to grind or repair the checks, not being in the water space, only the steam need be blown off and the fire banked, which greatly facilitates the despatching of engines. We find that the use of the check results in a very heavy deposit of mud and scale around the end of the flues and around the dry pipe, making it absolutely necessary to install near the check and on each side, wash-out plugs to loosen and wash out the scale and deposit. While there are a great many advantages to be derived from the use of a check of the above pattern, one of the greatest difficulties that is encountered, and a very serious one, is the fact that it is almost impossible to keep the joint between the check and the boiler tight, which not only results in the rotting out of the jacket but is a continual annoyance by keeping the sand wet.

The last fifty engines we received were equipped with checks of this pattern, and have been a continual source of trouble from this cause. It is due to having a heavy wrought iron branch pipe; the expansion from this pipe tends to break the joint, causing the check to leak and run down over the boiler and the steam to sweat the sand box, resulting in delays and in some instances failures due to the sand not running.

We have been experimenting with a high pressure pump arranged on one of our through freight engines, the pump utilizing a portion of the exhaust, combining the steam with the water from the tank and placing the water in the boiler at about 280 to 300 deg. at the mud ring. It has proven to be a great success in the test we have made, which has not been thoroughly enough to warrant further application at present. We have been enabled to save a great amount of coal, and the engine on which it was tried has not had a staybolt fracture, nor have the flues given any trouble whatever, since its application.

II.

BY A. F. BRADFORD,
General Foreman, C., C., C. & St. L.

Many roads are experimenting with the method of injecting the water into the boiler above the water line, the injected water being sprayed in and by the time it reaches the water line it is hot. By this method there will be no trouble with the flues on account of forcing the cold water against them, but, will the boiler steam as well and operate as economically as where the water is fed in below the water line? Some say the engines steam better and also that it is more economical. I should think that the steam would be of poorer quality and also that more economy would be gained by placing the feed water inlet below the water line on the side of the boiler back of the flue sheet. The engines on the P. & E. division of the C., C., C. & St. L. are fed in this manner and no trouble whatever has been found with the flues. A shield or box is placed on the inside of the boiler over the feed water inlet, and the injected water instead of coming in direct contact with the flues is forced upward and is warmed thoroughly before striking them, in this manner a better circulation is obtained for the injected water is first forced up, then as the warmer water from below comes up, the cooler water goes down, giving a good circulation and causing the boiler to steam better.

By feeding the water in below the water line a better quality of steam would be obtained, for if the cold water was sprayed in the steam, it would make the steam wet or of poor quality and dryness of steam is quite a factor in the operation of a locomotive. Even if the spray is not placed close to the steam dome, it is plain that the steam would not be of the same quality as if no water was mixed with it. We have an engine in the shop that is being equipped with a double check spray feed, placed on top of the boiler, but have no data as to its performance.

III.

C. W. SEDDON,
Superintendent Motive Power and Cars, Duluth, Missabe & Northern Ry., Proctor, Minn.

The point of water delivery to a locomotive boiler is a subject that has long been neglected. At least 75 per cent. of the engine failures on the average railway are due to boiler troubles, principally tubes, crown and staybolts leaking. The usual remedy applied is to send a boilermaker inside of the firebox to hammer up the staybolts, calk and expand the tubes and oftentimes roll them. Every time this operation is done the life of the tubes and staybolts is shortened, and in a short time tubes have to come out on account of beads worn out and staybolts with heads gone. Usually the tubes in front of the fire door have to be replaced first. The general opinion is that this is caused because of the cold draft from the fire door striking this point.

It is a well-known fact that where cold water mixes with hot water, the cold water will fall and settle to the bottom of the lowest point of a boiler; which in a locomotive would be around the water leg and bottom flues. Now with the old method the custom is to deliver the water in the boiler in a two-inch solid volume, the boiler check being located in the front course of boiler about midway up so that when engine is working hard, using both injectors, there are two solid streams of cold water being forced into the boiler mixing with the hot water. What is the result? The only possible thing that can happen to this cold water, is to settle around the water leg and bottom of tubes, cooling this part of the boiler. This variation in temperature is bound to contract the sheets and tubes, causing them to leak and in many cases the side sheets crack and the staybolts break. Is it not reasonable to suppose that if this feed water is heated to the same temperature as the water in the boiler, that a great deal of flue and firebox trouble can be cured?

Some three and one-half years ago we received two locomotives from a locomotive builder. After putting them in service we found it impossible to make a round trip of one hundred and fifty miles in passenger service because of tubes leaking. This continued until the transportation department condemned them and ordered them off the road until they could be put in shape to do business. We then turned engines over to the builder, advising them to either overcome the difficulty, or take the engine back. They sent out an expert who worked for six weeks trying every possible thing he could think of to overcome the trouble, and finally he gave it up as a bad job. I came to the conclusion that the trouble must be due to the

We connected an elbow to the boiler check on the inside of the boiler and carried the feed water as near to the surface of the water level in the boiler as possible before discharging it. After trying this we found we were able to make about two round-trips without the engines failing. This experiment proved that the trouble was due to feed water conditions. I then decided to deliver the water into the steam space in a spray and thus improve conditions still more. A copper pipe was connected to the boiler check, extending about 18 in. inside, with ⅜-in. holes drilled on the upper side to keep the water in suspension as long as possible, allowing the feed water to absorb heat from the high-pressure steam before mingling with other water in boiler. After applying feed water in this manner the trouble entirely ceased and from that day to this we have not had a minute's delay charged against these engines because of tube or boiler trouble.

Later on we had another engine giving trouble from tubes leaking, and in order to further demonstrate what could be done I decided to change the feed water and apply it in the same manner as in the other cases; after the engine came in leaking badly we made the change and sent it out without permitting the boilermaker to go inside to make repairs, the engine going out in the same condition as when it came in. The result was the leak stopped and from that time until engine went into shop, some six months later, we never found it necessary to send a boilermaker into the firebox. This convinced me beyond any doubt whatever that the old way was entirely wrong and I immediately ordered all our locomotives to have the feed water applied in the manner described. This order was put into effect about July, 1907, and in the spring of 1908 we had all of our power so equipped.

I have followed the matter up closely since that time and find our engines steam more freely, burn less fuel and reduce boiler repairs to a minimum; where we were using five and six boilermakers on roundhouse running repairs we now have but two, one man days and one man nights, and it is very seldom that either of these men is ever required to go into a firebox. We have also found that about 90 per cent. of the foreign matter is deposited immediately underneath the spray pipe, or in the front course of boiler. We have since placed a pan under spray pipe to catch all deposits before allowing them to fall and mingle with the tubes. This can be cleaned by removing the dome cap or connecting a pipe and blow-off cock, so arranged as to carry it away.

I am also informed that one railway which was troubled with bad water and boiler foaming that after applying feed water in this manner the trouble from foamy boilers was almost entirely eliminated, and I presume this is due to the fact that all solids or foreign matters are immediately precipitated and not allowed to mingle with the other water in the boiler.

The question has been asked whether if the holes in the spray pipe will clog up and put the injectors out of com-

mission. In the first place, if copper pipe is used, this is not apt to occur, as scale will not adhere to copper as readily as to iron or steel pipe. Also the spray pipe is so arranged that it can readily be removed if this condition should occur. In our three and one-half years' experience we have never found it necessary to remove one pipe from this cause.

Our records show that we have made a saving of at least 10 per cent. in fuel, 75 per cent. in boiler repairs, an increased tonnage of 10 per cent., and at the close of our ore season engines tie up in better shape than ever before. I am, therefore, thoroughly convinced that the only proper place to deliver feed water into a locomotive boiler is in the steam space, and the finer it can be broken up and held in suspension, the better results will be obtained.

Mr. Smith: It seems to me that this device makes claims for economy that, on the face of it, don't seem to be correct. No matter how the water is delivered, it must be heated to the boiling temperature. It seems to me that the only real advantage of such a device is the freedom from flue troubles.

G. H. Brown (International Correspondence Schools): On the Illinois Central Railway in the fall of '75, when S. S. Hayes was superintendent of motive power, they introduced water in their boilers in a similar manner in many cases, and in some instances they had another dome to the boiler. This dome was filled with scrap iron and the water, passing the checks, percolated through the scrap iron and then into the boiler.

J. J. H. McDonald (International Correspondence Schools): I am of the opinion that where the water is dropped down through the steam into the steam space that there is considerable benefit to be derived.

NEXT MEETING PLACE.

The selection of the next meeting place was discussed freely among the members. Though that question is left with the executive committee to settle, a vote was taken and Chicago was the unanimous choice of the convention.

NEXT YEAR'S WORK.

In discussing the work for the coming year there was a strong feeling expressed that the association had been unfortunate in the choice of the subjects selected for consideration at its meetings. The association is in splendid shape financially and has a good membership. By a better choice of subjects it is felt that it would not only widen its sphere of influence among the foremen, but would secure the co-operation of the higher officials in seeing that the foreman attended the meetings and engaged actively in the work of the association. In a nutshell, the idea expressed was that the meeting of the association should be devoted to the consideration of such subjects connected with the details of the shop and roundhouse work as would insure an increase in efficiency among its members. The executive committee has started actively to do this and the prospects for the most successful meeting next year are very bright.

Mr. Motta:—I believe we ought to confine our attentions to the handling of men, handling of the apprentices and the handling of the different classes of work that come under our jurisdiction. It is by our efficiency that we hold our positions; those are the subjects we ought to discuss, and also the best method of despatching the work. We may have a method that we think is all right, but if any of us should walk through the shop, some apprentice boy could give us pointers on some branch of the work. I believe in giving credit to any man who can produce an idea. It may be crude, but once you have an idea you can easily develop it.

PROFESSOR SCHNEIDER'S ADDRESS.

Prof. Herman Schneider, University of Cincinnati, spoke as follows:

I want to talk to you in a rather informal way this afternoon on the matter of apprentices. It will seem rather strange to you, and may even seem an effrontery, that a university professor should attempt to talk to you foremen on this question. It so happens, however, that for four years I have been in intimate relations with the machine shops of Cincinnati on a co-operative basis between the university and the shops for the training of the mechanical engineer. The scheme is a very successful one and I will explain a few of the details.

Our plan is to have students in mechanical engineering spend one-half the time in the commercial shops and one-half the time in the university. This week half the engineering students are working as apprentices in the commercial shops, the other half are in the university studying engineering. Next Monday morning these two sections will change about. These young men get the regular, rigid, stiff apprentice training of the machine tool shops of Cincinnati. They are under all the rules of shop discipline that the other men are under. At the university they take the regular mechanical engineer's course, and it is because we have operated that course successfully for four years that I have nerve enough this afternoon to come down and talk to you on this question.

Following the work which was started at the university, a number of other towns have taken up a similar arrangement. At Fitchburg, Mass., there is an arrangement between the high school and all the shops of the town for the training of machinists and of mechanical engineers. The details are similar, except that the course is four years in length, the students alternating between the high schools and the shop. Students, of course, are paid for the work while at the shop.

The fundamental principle underlying this work is the thing I want to try to impress upon you; that is, that the prime feature of apprentice training is in the shop and not in the school. In order to get successful mechanics and successful engineers, you have to take the school to the shop and not attempt to take the shop to the school.

Here in Cincinnati we have another arrangement for the machine shop apprentice, which is called a continuation school. It is a co-operative scheme between the public schools of Cincinnati and the machine shop. The idea is to take the instruction to the boy that is already on the job in the machine shop. The shops agree to send their apprentices one-half day per week to a school teacher especially selected to give the theory upon which the work is based. That school has been operating long enough to show that it is successful. Some of our best firms have a large number of apprentices there. The Fay & Egan Co. has 60 apprentices whom it sends a half day per week to the school. The shop pays the boy for the time he is in school just as though he were in the shop. You might imagine that it would be a rather expensive plan, but, as a matter of fact, you will find that the efficiency of the boys has increased so greatly since they have been in this school that it is not only no cost to the company, but there has been a certain gain. The thing that I am attempting to point out to you is a scheme whereby you have the old apprenticeship system with something new added, namely, a shop instructor.

Under the old system of production the foreman had time to instruct the men; under modern production, the foreman has to get out the work, the engines have to be got out. In the shop you can teach manual dexterity better than any place else, and a thorough appreciation of all the details necessary can be worked out and obtained only in a commercial shop worked under the right conditions.

Many attempts have been made to organize trade schools for teaching the boys the trades. The statistics available on those schools are rather interesting, and show that in nearly every case the boy who was trained in a trade school for a machinist never gets into the trade. That is not astonishing when you consider the training that they get. Time is not an element of their education. Most of it is on a certain type of manual training, such that when the boy has finished with it he does not want to be a machinist; he would rather be a draftsman at $50 a month than a machinist at $75. The same thing is true of the foundry schools. They give the fellows so much chemistry that when they get out they think they are chemists, but not for worlds could you get them to go into the foundry and do dirty work. It seems to me it would be hopeless to attempt to teach a trade in a school and expect the results that you men have to get from the skilled mechanic. There seems to be no other way of doing it than through some co-operative scheme.

I am at the present time retained by one of the trunk railways to work out an educational scheme to cover all departments, mechanical, maintenance of way, traffic, operation, finance, etc. In every case the thing that we shall attempt to do will be to take shop instructors into the shop, or to the work, taking the apprentices from their work at certain set times and giving them instruction and paying them while they are getting it.

There will be a great many different details to work out. In some of the shops the company will pay for the instructors; at other points the public schools will be brought into play, as in Cincinnati. We attempt to solve two questions when confronted with the problem of training of men. The first is what do these particular men need to know to make them more efficient in their work; what can we put into their heads to make them more efficient? The second is: when can we get at the man with a thorough, practical instructor? We do not attempt to teach them manual dexterity, because we know the shop itself will handle that much more thoroughly than any professional educator can do it.

The whole problem, in my opinion, will come back to the old apprenticeship system, with a shop instructor added to improve the workkman's mental efficiency in connection with

his manual dexterity. You will solve the problem by bringing into your shop an instructor who will teach the practical side, giving the boys while they are at the school a thorough practical training. The thing has got to be solved through a co-operative agreement between a school which your company may own, or which may be a part of the public school system, and your shop to work in very close harmony.

I want to go back a moment to our university work. We have a bunch of men whom we call shop co-ordinators. There are three of these men. It is their job to be out in the shop every afternoon and in the university every morning. This afternoon they are out in the shop observing what our student apprentices are doing. They go out and watch those young men on the machines, and observe every operation. It gives them industrial intelligence on the job. They keep that up throughout the whole year. The next week during the morning they have these men in classes and they point out to them the why and the wherefore of everything they have been doing during the past week. We have to give the men what the Germans call industrial intelligence and show them why they are doing a job and why they are doing it in a certain way. They must be taught the mechanical short cuts. They do not need to know the whole book of algebra, or geometry, but there are certain fundamental principles which are tremendous time savers. The manufacturers expect to get efficient mechanics out of our school because we have been careful to select shop instructors who keep their feet on the earth. They will not use a rule unless they can show a man how to use it to do a better job. The whole aim must be to give mental efficiency which will assist in improving manual dexterity.

I believe that with some of you conditions are such that you cannot employ a shop instructor. You may not have enough apprentices, or perhaps the railway will not stand for the expense. Please note this. The public school men of this country are hunting for some way to solve for themselves this tremendous problem of industrial education. In your own town you will find the problem is bobbing up in various forms and it has got to be met in some way. You men are not directly involved in commercial occupations, but you are indirectly involved because the volume of your business depends on the volume of commercial business done in this country. Those who have studied commercial statistics realize that there must be a solution of the problem of training for commercial pursuits.

Take a town like Cincinnati. Here are 400 distinct trades. We have had a great many officers ask us to point out a means for the training of men on some co-operative basis. We have had tailors, employers of women in the line or dressmaking, millinery, shoemaking, etc., appeal to us, and careful attention to the situation has disclosed the fact that there is a dearth of skilled artisans in practically every line of trade that is represented in this big industrial city. There is the same cry in all the other industries as in the machine shop; the schools have got to teach the trades. Consider what that means; if we are going to solve the problem of industrial education in that way we will have to teach two or three hundred trades at least. We will have to equip the schools with all the different types of machinery represented, and we will have to do that for all the children that go into the trades in Cincinnati.

It costs about $25 per child per year for the average public school instruction in the United States. When you put manual training into the public schools you run the cost up to $55 per child per year. When you put industrial trade training in, as in Milwaukee, the cost per child per year runs up to $400. When you consider the cost of equipment and the cost of training, you will see that the training for all the trades, for all the children, would bankrupt a city.

In the broader view of solving this problem of industrial education there seems to be just one way of doing it, and that is to take the school to the boy or girl who is on the job. Statistics prove that after they have been educated in schools the majority do not follow the trade for which they have been prepared. The one thing we are pleading for is a combination of the school and the shop, for efficiency and for all that goes to make a better mechanic. It seems to us after a trial both of the university end and the public school end, as I have indicated by the experience of the Fay & Egan Co. and others, such as the Cincinnati Planer Co., the Cincinnati Milling Co., etc., that is the only feasible scheme. It is less expensive than the public school instruction of the little boy or girl in the first to the fifth or sixth grade, and it does more work for efficiency in one year than can be obtained in four years of instruction without the combination. That may seem like a pretty broad assertion, but we have the time cards on it.

In a large eastern department store a manager asked if there was some scheme whereby he could train his 8,000 clerks. The proposition was: What do you want the people to know? We want them to know the psychology of work and have a scientific knowledge of the things they are handling. When can we have the people in the school? You cannot have them; they are employed. We said, "Are all your clerks busy all the time?" "No, we can spare half of our clerks until about 10 o'clock in the morning, when the women come down to do shopping." So that particular store now has a school whereby such teachers go into the store until about 10 o'clock. The efficiency there has increased remarkably. It is a safe proposition to tie up with a school or organize a school of your own. The expense involved will be more than paid by the increased efficiency of the workers.

H. D. Kelley (C. & N. W.): For some years past we have been particularly interested in apprentices. We have two apprentice instructors at Chicago who devote their entire time to the apprentices. We do not take the boy to the school room, as the New York Central, the Grand Trunk and the Santa Fe do, giving him training during working hours, but as he is working on his job we have these men follow him up and show him just how it should be done, giving him good advice and seeing that he follows a complete schedule that is laid out for his training. The boy who enters the shop is required to have a certain education. Then every fall we advise him to go to night school. We fortunately are situated near the Lewis Institute, where a boy can get first-class instruction at very little cost. After he has served a certain time we put him in the drawing room and keep him there six months; then we bring him back to the shop. We tried some years ago to have the company give the boy a certain amount of school instruction during working hours, but it was not prepared to do so and we organized a class to meet one night each week. We get the boys to take up a certain line of study. We assign a subject to a boy and he must write a paper; then it is discussed. The apprentice instructor is chairman.

The annual banquet was held on Friday night. After dinner a vaudeville entertainment, which was enthusiastically received, was given under the direction of the Railway Supply Men's Association.

RAILWAY SUPPLYMEN'S ASSOCIATION.

The following were elected members of the executive committee of the Railway Supplymen's Association for the ensuing year: J. W. Motherwell (*chairman*), Ashton Valve Co., Boston, Mass.; James C. Younglove (*secretary-treasurer*), H. W. Johns-Manville Co., New York; W. L. Allison, Franklin Railway Supply Co., New York; W. G. Wallace, American Steel Foundries Co., Chicago; B. J. Nelly, Jenkins Brothers, New York; F. E. Ransley, Greene, Tweed & Co., Chicago.

ATTENDANCE.

The following active members attended the convention. A number of associate members were also present. Several members were accompanied by their wives and families:

A. L. Ball, Gen. For., C., I. & S., Kankakee, Ill.
F. Bauer, Indianapolis, Ind.
F. M. Baumgardner, Y. & M. V., Vicksburg, Miss.
A. Barnes, Chicago.
B. A. Beland, R. H. For., St. L. & S. F., Springfield, Mo.
C. Bowersox, Gen. For., T. St. L. & W., Frankfort, Ind.
J. A. Boyden, Gen. For., Erie, Cleveland, Ohio.
A. F. Bradford, C., C., C. & St. L., Urbana, Ill
H. M. Brown, Asst. M. M., C. & O., Hinton, W. Va.
I. H. Bryan, Gen. For., D. & I. R., Two Harbors, Minn.
J. E. Buckingham, U. S. Yards Co., So. Omaha, Neb.
R. W. Burnett, I. C., Mattoon, Ill.
E. D. Colon, Grand Rapids, Mich.
C. I. Dickert, Gen. For., C. of Ga., Macon, Ga.
J. J. Donovan, C., N. O. & J. P., Ludlow, Ky.
A. E. Douglass, C., C., C. & St. P., Cincinnati, Ohio.
W. S. Dresser, C., C., C. & St. L., Peru, Ind.
W. H. Dunlap, L. & N., Covington, Ky.
Henry Eisele, Wabash, Ft. Wayne, Ind.
J. A. Finical, Erie, Galion, Ohio.
F. W. Fritchey, G. F., C., C., C. & St. L., Sandusky, Ohio.
A. B. Fromm, C., I. & S., Gibson, Ind.
C. W. Fromm, C., I. & S., Kankakee, Ill.
H C. Gillispie, Russel, Ky.
William S. Gray, L. & N., Covington, Ky.
T. F. Griffin, Gen. For., C., C., C. & St. L., Indianapolis, Ind.
W. Griffith, G. F., Pere Marquette, Ft. Thomas, Ont., Can.
W. C. Groening, Pere Marquette, Grand Rapids, Mich.
William Hall, C. & N. W., Escanaba, Mich.
B. F. Harris, G. F., C., H. & D., Cincinnati, Ohio

J. H. Henfield, Erie, Port Jervis.
C. M. Hitch, Gen. Car. foreman, C., H. & D., Cincinnati, Ohio.
J. J. Houlihan, Wabash, Ft. Wayne, Ind.
J. S. Johnson, R. H. For., D. & I. R., Two Harbors, Minn.
H. D. Kelley, C. & N. W., Chicago.
W. L. Kellogg, S. M. P., C., H. & D., Detroit, Mich.
P. C. Leary, N. & W., Roanoke, Va.
J. A. LeMieux, R. H., C., C. L., Peru, Ind.
J. E. Lester, C., N. O. & T. P., Ludlow, Ky.
J. P. McCuen, Supt. M. P., Q. & C., Ludlow, Ky.
William Mills, C., H. & D., Indianapolis, Ind.
C. W. Moats, P. & L. E., Beaver Falls, Pa.
W. L. Monning, storekeeper, C. & O., Covington, Ky.
Stephen Motta, National of Mexico, Aguascalientes, Mex.
E. A. Murray, M. M., C. & O., Lexington, Ky.
T. H. Ogden, Gen. For., A., T. & S. F., Dodge City, Kan.
J. H. Painter, Supt. Shops, A. C. L., Rocky Mount, N. C.
F. C. Pickard, M. M., C., H. & D., Indianapolis, Ind.
W. G. Reyer, Gen. For., N., C. & St. L., Nashville, Tenn.
W. Rose, C., H. & D., Cincinnati, Ohio.
H. L. Roth, C., N., O. & T. P., Ludlow, Ky.
J. W. Savage, Q. & C., Ludlow, Ky.
H. Scatchard, N. & W., Roanoke, Va.
J. Schlageter, Toledo Ter. Co., Toledo, Ohio.
C. J. Scudder, Pere Marquette, Saginaw, Mich.
H. J. Sentman, P., C., C. & St. L., Bradford, Ohio.
S. Skidmore, C., C., C. & St. L., Cincinnati, Ohio.
W. Smith, B. & O., Benwood, W. Va.
W. T. Smith, S. M. P., C. & O., Covington, Ky.
A. Telford, Pur. Agt., Q. & C., Cincinnati, Ohio.
George Tozzer, P. A., C., C., C. & St. L., Cincinnati, Ohio.
R. W. Turney, C. & O., Huntington, W. Va.
R. B. Van Wormer, A. C. L., Waycross, Ga.
C. H. Voges, C., C., C. & St. L., Bellefontaine, Ohio.
W. H. Wallace, Indianapolis, Ind.
F. J. Walsh, Gen. For., C. & O., Thurmond, W. Va.
R. W. Woods, Gen. For., C. & O., Clifton Forge, Va.
Thomas Zinkan, C., C., C. & St. L., Delaware, Ohio.

EXHIBITS.

The exhibitors at the convention, including the products exhibited and the representatives present, were as follows:

Armstrong Bros. Tool Co., Chicago.—Armstrong tool holders and ratchet drills. Represented by Paul Armstrong, James W. Barber.

Ashton Valve Co., Boston, Mass.—Pop safety valves and steam gages. Represented by J. W. Motherwell.

Celfor Tool Co., Buchanan, Mich.—Celfor twist drills and reamers. Represented by J. J. Dale.

Chicago Pneumatic Tool Co., Chicago.—Pneumatic tools. Represented by Charles E. Walker, Thomas Aldcorn, J. C. Campbell, C. E. Walker, Jr.

Crane Company, Chicago.—Valves, steam fittings and locomotive specialties. Represented by G. S. Turner.

Crucible Steel Co. of America, Pittsburgh, Pa.—Catalogues descriptive of high grade tool steel. Represented by F. A. Lawler, William Stevenson.

Curtain Supply Co., Chicago.—Curtain fixtures; vestibule curtain release handles; improved vestibule curtain hook No. 6, with steel roller; vestibule diaphragms. Represented by Stanley W. Midgley.

Dearborn Drug & Chemical Works, Chicago.—Circulars descriptive of Dearborn feed water treatment; boiler compounds. Represented by Paul T. Payne.

Detroit Lubricator Co., Detroit, Mich.—Bullseye locomotive lubricator with oil control valve; also double and single sight feed air pump air cylinder lubricators. Represented by A. D. Howard.

Joseph Dixon Crucible Co., Jersey City, N. J.—Samples and catalogues descriptive of graphite. Represented by F. R. Brandon.

Fairbanks, Morse & Co., Chicago.—Duff-Bethlehem forged steel hydraulic jacks; steam pumps, hoists, track tools, etc. Represented by J. L. Jones.

J. A. Fay & Egan Co., Cincinnati, Ohio.—Photographs of woodworking machinery. Represented by S. P. Egan, Cliff E. Egan.

Franklin Railway Supply Co., New York.—Franklin driving box lubricators; McLaughlin flexible joints; Franklin vertical and horizontal fire doors; Franklin steam grate shakers; Security brick-arch; Franklin steam chest plug; McLaughlin lock-nuts. Represented by W. L. Allison, R. G. Coburn, Paul Weller.

Garlock Packing Co., Palmyra, N. Y.—Garlock packings. Represented by J. J. Pokorney.

Gold Car Heating & Lighting Co., New York.—Combination vapor and pressure system for car heating; steam hose couplers; engine and temperature car regulators. Represented by W. H. Stocks, J. O. Brumbaugh.

Goldschmidt Thermit Co., New York.—Thermit and appliances for welding frames; pipe welding and foundry applications. Represented by J. G. McCarty.

Green, Tweed & Co., New York.—Palmetto self-lubricating packing; Favorite reversible ratchet wrench. Represented by F. E. Ransley, B. M. Bulkley.

Hunt-Spiller Manufacturing Co., Boston, Mass.—Hunt-Spiller gun iron for locomotive castings. Represented by J. G. Platt.

Jenkins Brothers, New York.—Valves; Jenkins '96 packing. Represented by B. J. Neely, C. F. Beckwith.

H. W. Johns-Manville Co., New York.—J-M packings; J-M Immovable guy anchor; descriptive circulars of Johns-Manville products. Represented by James C. Younglove, C. E. Murphy.

The E. A. Kinsey Co., Cincinnati, Ohio.—Norton grinding wheels; Homestead valves; Use-Em-Up drill sockets; Sterling hack saws; Williams Superior drop-forgings. Represented by F. C. Bentley.

Nathan Manufacturing Co., New York.—Nathan lubricators; injectors; Klinger water gages; Coale mufflers and pop valves; Hart valve. Represented by C. A. Nathan, J. S. Seeley.

Otley Manufacturing Co., Chicago.—Eureka steam joint cement; graphite paints and lubricants. Represented by Benjamin F. Otley.

Storrs Mica Co., Owego, N. Y.—Storrs Never-Break mica chimneys and globes. Represented by Charles P. Storrs.

Strong, Carlisle & Hammond Co., Cleveland, Ohio.—Randall graphite sheet lubricators. Represented by B. E. Carpenter.

Talmage Manufacturing Co., Cleveland, Ohio.—Talmage system ash-pan cleaner door. Represented by J. G. Talmage, J. F. Walker, E. H. Janes.

West Disinfecting Co., Cincinnati, Ohio.—Disinfecting appliances. Represented by Charles F. Pierce.

Westinghouse Air Brake Co., Pittsburgh, Pa.—Catalogues descriptive of Westinghouse galvanized annealed steel hose clamps; centrifugal dirt collector; compound air pumps; improved triple valve test racks for cleaned or repaired triples; E. T. locomotive brake equipment, etc. Represented by I. H. Brown, J. S. Siegrist, R. W. Williams.

GERMAN WATER SOFTENER.

A recent development in Germany of a method of water softening and preventing boiler incrustations is accredited to a German chemist, Dr. R. Gans, professor and chief of the Laboratory for Soil Investigations of the Royal Prussian Geological Institution of Berlin. It consists in filtering the water through a composition called permutit, by which the calcium or lime, manganese, iron and magnesium compounds are, it is claimed, wholly removed. When desired the compounding of the permutit may be such as to leave either the lime or magnesium in the water.

Permutit is obtained by smelting alumina with an alkaline carbonate and the addition of quartz. The resulting compound, after having been washed until free from alkali, is a granulous or even laminated soda-aluminum silicate or natrium-zeolith, which is capable of exchanging its entire content of sodium, not only for calcium and magnesium, but also for metals. If, for example, the water to be softened contains in solution lime sulphate or sulphate of calcium, the latter will, when brought into contact with permutit, part with its lime or calcium, which is replaced by sodium, so that there remain in the filter sulphate of sodium and calcium-zeolith. This reaction may be expressed chemically as follows: $Na_2Al_2Si_2O_8 + CaSO_4 = CaAl_2Si_2O_8 + Na_2SO_4$.

When the attractive power of permutit for the lime or other substance which renders the water hard has become wholly exhausted, it may be completely regenerated by the use of common salt, or even denatured salt, which in Germany costs about 75 cents per 220 lbs. The action of the salt in the regeneration of the permutit consists simply in replacing the element of calcium in the calcium-zeolith with two parts of sodium, thus giving the original natrium-zeolith. The following formulas show this chemical change: $CaAl_2Si_2O_8 + 2NaCl = Na_2Al_2Si_2O_8 + CaCl_2$. The affinity of the calcium in the zeolith combination being stronger than that of the sodium, an excess of the salt must be used to effect the complete transformation to the sodium-zeolith. The operation is simple. The salt is first dissolved in requisite quantity, and after the filter has been freed from water at the close of the day, half of this brine is allowed to flow in and remain two hours, after which the outlet, and at the same time the inlet, are so regulated that the remainder of the brine will flow through the filter during the night. The following morning the filter is flushed until the surplus salt and the deposit of bichloride of calcium which has been separated from the calcium-zeolith have been completely washed away. It is then ready for use again.

Permutit costs about 8 cents per pound. A plant using for 10 hours daily 35.3 cu. ft. per hour of water having 25 degs. of hardness needs about 220 lbs. of permutit. The apparatus to hold this quantity, including the mounting, costs about $82. Such plants complete are being sold by the company controlling the patents for about $250.

It is the company's intention to sell to individual firms in other countries the right to manufacture the composition. Some of the European rights have already been sold. An American company is negotiating for all rights for manufacturing in the United States, for which a large sum and a royalty for each pound manufactured are asked.

General News Section.

The Postal Telegraph Cable Co. announces that on June 1 the wages of the operators in its important offices will be increased at varying rates from 5 per cent. upward.

All the offices of the Chicago & Eastern Illinois which were formerly in the La Salle street station, Chicago, have been moved to the McCarmack building, Michigan avenue and Van Buren street.

The Massachusetts legislature has passed and the Governor has signed a law making it obligatory on employers of labor, in advertising for help during labor disputes, to explicitly mention in their advertisements that a strike, lockout or other labor disturbance exists. The maximum penalty for violation is $100.

The Northern Pacific is still expanding its farming operations, and has lately bought a very large tract of fertile land near Kent, Wash., where fruit, meat and vegetables will be provided for the dining cars of the road. Five hundred or more cows and other animals are already on the farm and 150 Japanese laborers have been engaged. Near Paradise, Mont., another large farm of the company is devoted to raising garden vegetables.

W. L. Park, vice-president of the Illinois Central, formerly general superintendent of the Union Pacific, has introduced on the Illinois Central the practice, which has been in vogue on the Union Pacific for several years, of inviting disinterested citizens to sit with officers of the company in their investigations of train accidents. At Jackson, Miss., R. L. Sanders joined with officers of the road in declaring that a recent derailment was due to malicious loosening of a joint in the track.

Louis Brennan, of London, maker of the gyroscope monorail car described in the *Railway Age Gazette* of Nov. 26, 1909, has received orders for two cars to be sent to Alaska, where it is said a company of Americans headed by John Ballaine, plans to build a railway of 100 miles long from Matamiska coal fields toward Fairbanks. Laying only a single rail, it is expected that the cost of the road will be not over $3,000 a mile. It is said that one of Mr. Brennan's gyroscope cars has carried passengers at the rate of 26 miles an hour.

The report that an officer of the Cumberland Valley, who had made some surprise tests, had been arrested for illegal tampering with signal lights, is declared by an officer of the road to be absolutely without foundation. The report, it will be recalled, included a rumor to the effect that the instigators of the arrest were enginemen who had felt themselves injured by tests which were made by the officer. The reporter who thought that the enginemen instigated arrests was mistaken; he should now tell us who instigated the rumor.

Charles Hansel, appointed by the governor of New Jersey to continue the work of valuing the railway property of the state—which was carried on last year by a commission consisting of Samuel Whinery, Charles Hansel and Frank Stevens—announces that Louis Focht is to assist him, with the title of chief engineer in charge of permanent way. Mr. Focht was for 10 years engineer of the Eastern division of the Lehigh Valley and was with that company altogether 14 years. For the last dozen years he has been engineer to the State Board of Assessors in New Jersey.

A conference between committees representing the municipal assembly of St. Louis, the shippers of St. Louis and the railways entering that city was held on April 27 at the Mercantile Club for the purpose of discussing the question of the abolition of bridge arbitraries at St. Louis—the charges for carrying freight across the Mississippi river. On motion of Benjamin McKeen, general manager of the Vandalia, it was decided to have sub-committees appointed to represent the various interests, and the conference then adjourned subject to call by these sub-committees.

According to a Massachusetts paper, the principal freight station of a prominent railway—the name of which does not begin with B—has got along three months without scales, except a track scale. Where the tally man had to state the weight of a shipment of which the consignor had given no weight, he has arrived at the correct figure by the secret processes of his own mind. It appears that the state sealer of weights and measures condemned the scale, which had long served in this freight house, and forbade its use; and not in three months was the railway able to supply a new scale to take its place.

The American Express Company has taken over the express business on the Oregon & Washington, superseding Wells-Fargo & Co. F. R. Parsons, route agent of the American Company, was quoted at Tacoma as saying that express matter would in future be transported from New York to Puget Sound in four days. This record would be made possible by the use of the express specials of the American Company, which leave New York each evening, running over the New York Central and Michigan Central to Chicago; from Chicago to Fremont, Neb., over the Chicago & North Western; thence over the Union Pacific, Oregon Short Line and Oregon Railroad & Navigation lines to Portland in time for morning delivery there on the fourth day. The Oregon & Washington car, which will be part of the train, will leave Portland in the morning, arriving at Puget Sound points in the afternoon.

According to a bulletin issued by the Bureau of Labor at Washington, the Canadian law to facilitate mediation in industrial pursuits is now quite generally approved by the general public and by most employers. It has been in force three years and at the end of two years and five months boards of mediation (of three persons each) had been appointed and acted in 59 disputes, involving 65,500 employees. The principal usefulness of a board is in bringing the parties to a controversy together for an amicable discussion. The law applies to a limited number of industries, mainly the public utilities and coal mines. The leaders of the railway unions are said to be divided in their opinions of the value of the law but, on the whole, are more favorably inclined than at first. The law has not prevented strikes in every case where it has been applied, and in some cases strikers have defied it with impunity, but there is no apparent likelihood that it will be repealed.

The Mulheim Collision.

As already noted in the *Railway Age Gazette*, a rear collision of passenger trains at Mulheim-on-the Rhine, Germany, March 30, resulted in the death and injury of a large number of soldiers. An express train ran into the rear of a special train which was conveying furloughed soldiers back to their regiments, and 19 persons were killed instantly and 56 injured, of whom three died afterwards. This collision is spoken of as the most serious accident, in its consequences, that ever happened on the Prussian State railway system. A week later von Breitenbach, the responsible Minister, before dicussing the estimates for the coming year in the Prussian House of Delegates, spoke of this accident at some length. It occurred, he said, on a part of the system which about a year before had been constructed and equipped in a manner which experts considered to be as nearly perfect as modern engineering could make it. All switches were protected by home and distant signals, and all were connected electrically with an interlocking system. The accident occurred in broad daylight and there was no fog or anything to prevent seeing the signals, yet the engineman of the express ran past both the distant and the home signal; past the signal tower, where a red flag was displayed, a horn blown, and desperate warnings shouted, and into the rear of the special train, which was about to enter a siding. This engineman had run express trains for years and was perfectly familiar with the line. He had been on duty 4¾ hours. He will be tried on a criminal charge.

As to what can be done to prevent such accidents in the future, the Minister was at a loss what to say. At the place

where the accident occurred, everything had been provided to secure safety which the technical authorities desired. It had been suggested that provision might be made to stop automatically a train which overruns a signal. "Unfortunately, I must confess that the experiments made hitherto in this direction have yielded unsatisfactory results, and this not only on the Prussian State railways, but, I believe, everywhere else. The automatic braking of trains, to prevent overrunning signals, we, in common with all railway managers of Central Europe, reject, and we reject it because we consider it to increase and not to decrease danger; we fear that such a method, independent of the will of the engineman, will only lead him to be less alert, which could not be permitted. We know, too, that the apparatus for such braking must under all circumstances work promptly, while it is subject to very various influences, which we cannot control." Experiments are under way to provide an automatic acoustic signal on the engine, so that an error or negligence of the eyes may be corrected by the ear. How these experiments will turn out remains to be seen, but there is danger that all remedies for negligence will result in lessening the attentiveness and alertness of the enginemen. There is hope that these qualities in the men may be cultivated and increased by self-registering apparatus which will show every case of over-running signals, whether it results in accident or not. The Prussian lines are beginning to test such devices, and will soon have more of them. Generally the management hopes most from a careful selection and training of the men, especially of the locomotive men. Safety in operation depends overwhelmingly on moral qualities—calmness, presence of mind and ingrained devotion to duty.

The Western Indiana Real Estate Fraud Case.

The Chicago & Western Indiana has renewed its suit in the courts at Chicago against John C. Fetzer for alleged frauds committed by him in acquiring real estate in Chicago for this road. The road seeks from Fetzer $525,000, out of which it claims he defrauded it, and $75,000 damages additional, a total of $600,000. In connection with this action it is announced that Benjamin Thomas, former president, and Charles R. Kappes, former real estate agent of the road, who were alleged to be implicated in the frauds with Fetzer, have paid to the road $76,000.

Judge Kersten, of the criminal court, on petition of the state's attorney, has ordered the impaneling of a special grand jury to investigate charges made by Mr. Fetzer that the Chicago & Western Indiana had used a "slush fund" of large proportions to bribe members of the Chicago council and of the Illinois legislature. It will be recalled that, as previously stated by the *Railway Age Gazette*, the board of directors of the Chicago & Western Indiana laid the evidence of the alleged frauds before State's Attorney Wayman and asked him to seek the indictment of Messrs. Thomas, Kappes and Fetzer. The state's attorney, however, refused to move for indictments. The charges made against Messrs. Thomas, Kappes and Fetzer were outlined in the *Railway Age Gazette* in its issue of January 28, page 197.

The action of Judge Kersten in calling a special grand jury grew out of a bill filed by Fetzer in an attack made by him on the award made by E. C. Field, who was chosen to arbitrate the differences between the Chicago & Western Indiana and Messrs. Thomas, Fetzer and Kappes after the original suit was brought. Mr. Field, as will be recalled, held that these men should pay to the road $525,000. Mr. Fetzer implies that at least part of this money was used by the road in getting a bill through the Illinois legislature a year ago to remove a cloud from the legality of a bond issue for $50,000,000. In his declaration he quotes a letter from F. A. Delano, president of the Wabash and one of the directors of the Western Indiana, to Mr. Thomas, in which Mr. Delano said: "I believe we should in a quiet way get the legislation which Judge Henry and our counsel concluded is desirable." A bad construction is sought to be put on Mr. Delano's use of the word "quiet."

Mr. Delano has issued a statement in reply. He says that on January 21, 1907, $8,000,000 of three-year notes which were secured by the consolidated mortgage bonds of the Chicago & Western Indiana were sold to the Illinois Trust & Savings Bank and to Lee, Higginson & Company. After the notes had been sold, counsel for the Boston bankers discovered what he thought was a flaw in the original incorporation of the road. After a good deal of discussion as to the best method of removing the cloud, the question was left to W. J. Henley, general counsel of the Western Indiana, and Wells H. Blodgett, general counsel of the Wabash. The only interest Mr. Delano had in the matter was as a director of the Western Indiana, representing the Wabash, and as a member of the committee of the board that negotiated the sale of the notes. C. N. Travous, general solicitor of the Wabash, under date of February 25, writing to Mr. Delano for himself and Mr. Blodgett, recommended that it would be advisable to get a validating act passed, and shortly after receipt of this letter Mr. Delano wrote to Mr. Thomas the letter quoted in Mr. Thomas' declaration. Continuing, Mr. Delano says:

"It seems to me that the necessity for so handling a matter of this extreme delicacy ought to be sufficient explanation for the use of the expression 'in a quiet way.'" Mr. Delano adds:

"Mr. Thomas, then president of the road, stated in my presence to Morton D. Hull, a member of the legislature, that no money whatever was being or would be used to bring about the passage of the act, and explained to Mr. Hull in fullest terms the reason for the bill. I personally know that a number of members of the legislature, as well as of the Chicago newspapers, took pains to find out all about this bill and satisfied themselves that it was a perfectly proper measure before voting for it.

"The important thing for the public to remember is that this story of a 'slush fund' is gotten up by Fetzer or his counsel to divert public opinion from the real issue. The Chicago & Western Indiana was robbed and is demanding restitution of the money. It is no adequate defense to say that this money, though stolen, was used for the benefit of the railway company in corrupting the legislature or the city council or any one else.

"I feel confident that no such use was made of the money, but, if it were, that is only all the more reason for thorough ventilation of the case."

Woods Public Utilities Bill Defeated.

The Woods Public Utilities Bill, which had been passed by the lower House of the Ohio legislature, was defeated in the Senate on April 28 by a vote of 22 to 10. Its defeat undoubtedly was largely due to work done by the Ohio Business Committee of the Railway Business Association. The Railway Business Association throughout the discussion took the position that fuller consideration should be given to any such measure before it was adopted than had been given to the Woods bill. Largely through its work a public sentiment was created which resulted in hundreds of letters and telegrams being sent to Senators by business men from all parts of the state, and in the adoption of resolutions condemning the Woods bill by the Chambers of Commerce of Cleveland, Columbus and Dayton, and the Board of Trade and the Real Estate Exchange of Canton. The result was not only to make the members of the Senate realize the crudity of the bill but to also create a very strong doubt as to whether it had the backing of public sentiment.

Railway Matters in Washington.

Washington, May 4, 1910.

The bills to amend the Interstate Commerce law have been discussed at great length during the past week, and the leaders of the majority have had to submit to such important amendments that they not only begin to think that no satisfactory law can be passed, but have become so discouraged that they will be satisfied apparently to let the bills fail—rather than have them passed in a very unsatisfactory form. The first important amendment was one offered by Representative Bartlett, of Georgia, to include telegraph and telephone companies in the term "common carrier." This was passed in the House by a vote of 109 to 73, notwithstanding strong arguments presented against it by Messrs. Mann and

Townsend. A proposition to cut out the clause establishing a commerce court came within three votes of being adopted. In this and other votes the insurgents, aiming mainly to strengthen their positions politically at home, finding that they had nearly or quite enough strength to defeat any proposition not satisfactory to them, proceeded to demand whatever they wanted. On Friday Mr. Madden, of Illinois, proposed an amendment to require the Interstate Commerce Commission to make a physical valuation of all the railways in the country, and it was adopted in the house by a vote of 130 to 67. The Democrats voted for this solidly and it was supported by many regular Republicans. In the Senate the regulars held their ground, but a proposal of Senator Cummins to weaken the clause permitting railways to make traffic agreements with each other—which is only a reasonable modification of the anti-pooling and anti-trust laws—was rejected by the rather narrow vote of 35 to 29.

On Monday of this week, after a protracted conference, the leading regular Republican senators virtually admitted that the insurgents would have their way and eliminate from the bill all of the important sections above mentioned, and also that allowing a railway which owns more than half of another to acquire the rest of that other's stock. On Tuesday both the Senate and the House adopted, with little or no discussion, amendments which would cut out the section permitting traffic agreements, and in the Senate a motion by Senator Nelson to eliminate section 12, authorizing mergers, was adopted without debate. On the same day a proposition to make the long and short haul clause universal, eliminating that feature of it which permits a suspension where water competition exists, was adopted by a vote of 172 to 48.

The Accident Law.

The law to require monthly reports of all railway accidents, superseding the law now in force, which was passed in 1901, and authorizing the Interstate Commerce Commission to investigate accidents, has finally passed both houses of Congress. It goes into effect 60 days after it is signed by the President, which means about July 1 next. As finally agreed on in the conference committee, the law requires monthly reports (as at present), but these reports must embrace all accidents instead of being confined to train accidents and to casualties to passengers and employees. That is to say, accidents to wayfarers at highway crossings; to trespassers and others walking on the tracks, and in fact all classes of injuries to persons must, under the new law, be reported monthly and in detail. Heretofore those accidents which are not included in the monthly reports have appeared only in the tables of totals sent in by the railways with their anuual financial reports. In this way the total for the country has been made public many months later than the facts gathered in the monthly reports. Under the new law a serious injury to the roadbed, as, for example, by flood, must be reported, even though it does not cause a derailment. The railways are relieved from the duty of reporting the total number of accidents in their annual reports. The section giving authority to investigate includes "collisions, derailments or other accidents resulting in serious injury to person or to the property of a railroad." The commission, or its investigator, may subpœna witnesses and require the production of papers, etc., and shall be provided by the carriers with all reasonable facilities. Where a state commission investigates an accident the Interstate Commerce Commission shall, if convenient, make its own investigation at the same time in connection with the investigation by the state officers. The commission is to exercise its discretion as to making public its reports and findings concerning accidents. As in the present law, facts gathered by the commission shall not be admitted as evidence in any suit for damages, and the same applies to its findings or conclusions.

Negotiations Concerning Wages.

The Baltimore & Ohio has increased, by 6 per cent., the pay of all employees receiving $200 a month or less, except those classes with which agreements have recently been made. The increase applies to the pay rolls for the month of April.

The Atlantic Coast Line has made an increase of about 6 per cent. in the pay of agents, clerks and other employees on salaries who receive $125 a month or less.

The New York, New Haven & Hartford and the Boston & Maine have made an increase of about 7 per cent. in the pay of freight handlers in Boston and other cities.

The Boston & Maine has increased the pay of locomotive firemen.

The Gulf, Colorado & Santa Fe has made an increase of 6 per cent. in the pay of its employees not belonging to labor unions in the states of Louisiana, Texas and Oklahoma.

The Cincinnati, Hamilton & Dayton and the Chicago, Indianapolis & Louisville have agreed to make the same advances in pay that are recommended by Messrs. Clark and Morrissey for the New York Central Lines west of Buffalo. These rates have to do only with the wages of conductors and trainmen (brakemen).

The Kanawha & Michigan has agreed to pay its conductors, brakemen and yardmen the rates recently adopted on the Baltimore & Ohio.

The Central of Georgia has increased the pay of section foremen.

The Erie Railroad is negotiating with representatives of conductors and brakemen regarding wages.

The Delaware, Lackawanna & Western has offered to firemen an increase of 8½ per cent. in wages.

The Cincinnati, Hamilton & Dayton has increased the pay of switchmen.

A press despatch from Sedalia, Mo., May 2, says that the machinists in the shops of the Missouri Pacific at that place have struck for an increase of pay. They demanded an increase of from 36 cents an hour to 40 cents; the company offered 39 cents. About 125 members of the International Association of Machinists in the employ of the Baltimore & Ohio Southwestern went out on strike May 2.

Freight handlers in Chicago have rejected an offer of an increase of one cent an hour in their pay.

A Correction.

In the report of the discussion on the subject "Locomotive Headlights and Observation of Signals," which was printed in our issue of April 29th, page 1098, H. T. Bentley, assistant superintendent of motive power, Chicago & North Western, was quoted as referring to certain tests which were made by Prof. Chamberlain and Max Toltz two years ago as having been made for the Chicago & North Western. These tests were made at St. Paul under the direction of Messrs. Chamberlain and Toltz, and were for the Great Northern.

Southern Pacific Oil Lands.

One of the most prominent oil operators of California has stated to the writer that Southern Pacific has between 65,000 and 75,000 acres of proved oil lands, in addition to a great domain of unproved lands lying in the oil districts. It owns alternate sections for some 20 miles through the Midway field that promises to be one of the largest in the world, and also through the rich Kern field. At the present time the price of proved lands in California fields ranges from $1,000 to $4,000 an acre. Should the Southern Pacific sell its entire holdings in the oil fields, exclusive of those it controls through the Associated Oil Co., conservatively figured the aggregate windfall to the shareholders would be well above $100,000,000.

Allowing for the increase of the outstanding Southern Pacific stock to $335,000,000, to include $62,000,000 that would be issued at the instance of holders of approximately $80,000,000 bonds, convertible at 130, the above estimated proceeds would mean a special dividend of approximately $30 a share. At this rate Union Pacific's plum, as the holder of 1,266,000 shares of Southern Pacific, shown on the books as of March 4, 1910, would be over $37,000,000.

The public has had no conception of the magnitude of the equity inhering in Southern Pacific stock, by virtue of the oil properties which have been included in the company's annual reports only under the 14,000,000 acres of lands owned. Seeming indifference to this asset on the part of investors not unacquainted with its existence has been due chiefly, perhaps, to the general impression that the Southern Pacific

would retain these lands for fuel supply, and that any benefit to stockholders would accrue only gradually in the form of greater net earnings, through decreased operating expenses.

It may be noted now that the company's fuel oil supply is assured for a half century through its majority holding of the stock of the Associated Oil Co., which handles almost 40 per cent. of the output of California, and has under ground, on its own owned and leased lands an estimated minimum supply of over 600,000,000 barrels. At present the Harriman lines are consuming about 10,000,000 barrels per annum.—*Wall Street Journal.*

Higher Degrees at Massachusetts Institute of Technology.

The Massachusetts Institute of Technology will this year, for the first time, confer the degree of Doctor of Engineering in course. The institute has heretofore given a good many second degrees for advanced study in engineering, and a few degrees of Doctor of Philosophy to students who have pursued advanced study in chemistry and other more general sciences, but it has not heretofore conferred a doctor's degree on a student for extended advanced study of engineering. H. S. Osborne, who is carrying out work for the degree of Doctor of Engineering, in a recent lecture, gave the results of studies he has made of the effect of high voltages on insulating material. He has formulated theories of these effects which are in closer harmony with experimental facts than the theories usually stated. Professor Harold Pender will lecture to graduate students next year on the high voltage alternating transmission and utilization of power, and more attention will be given to the conditions arising from the utilization of the power. Professor Jackson will lecture to graduate students on the organization and administration of public service companies, and in addition to this year's subjects will take up the theory underlying methods of charging for service by public service companies.

Grand Trunk Exhibit at Brussels.

The Grand Trunk building and exhibit at the Brussels International Exposition includes not only a great variety of features in connection with the Grand Trunk, but deals exhaustively with the Grand Trunk Pacific. A magnificent collection of grains in the straw, grasses and other products of Western Canada are on view. The Mountain division is represented by handsome oil paintings of scenes in the Yellowhead Pass and on the Skeena river, British Columbia. There is a moving picture exhibit. This is in an annex to the main Grand Trunk building, and entertainments will be given daily of mining scenes in Cobalt, harvesting, threshing and other agricultural scenes in Western Canada, and the construction of the Grand Trunk Pacific Railway.

Railway Business Association on Proposed Federal Legislation.

Bulletin No. 2 of the Railway Business Association shows that from March 4, 1909, to April 19, 1910, no less than 11,682 bills, exclusive of pension bills, were introduced in Congress, and that of these 109 exclusively affected railways. The bulletin reviews various proposed enactments. One of the amendments to the administration bill referred to is that which provides that no carrier "shall charge any greater compensation as a through rate than an aggregate of the local rates." In reference to this the bulletin says:

"During the hearings a member of the House committee raised the question whether such prohibition would not deprive the Interstate Commerce Commission in certain classes of cases of the power to fix interstate rates by requiring that the rate should not exceed the sum of the rates fixed by two or more state commissions. We have found in the testimony no manifestation of a demand for federal legislation increasing the present indirect power of state commissions over interstate business."

Continuing the bulletin says:

"We urge members of Congress to be on their guard against the illusion that invisible and inaudible advocates people the air and must be propitiated. They may well challenge every amendment that knocks at the portals and demand to know who stands sponsor and on what grounds. In the case of the full crew bills, when the opposition evidence was all in a member of the committee exclaimed:

" 'I am trying to find out the origin of this bill and why it was brought in here.'

"No witnesses whatever appeared in favor of it. We suggest this committeeman's question as a standing interrogatory:

" 'What is the origin of this proposition? Why was it brought in here?'

"We hope nothing will be done in haste to be repented at leisure. Recently employers and employees have had leisure enough.

"A reduction of lawmaking to the correction of evils demonstrated, by remedial legislation carefully digested and precise in its terms, leaving naught to chance, creating no possibilities of endless litigation to ascertain its intent and meaning, is what this association is striving for. For lawmaking as a mere exercise of power, striking at an object wildly and in the dark, good in part, perhaps, bad in part, doubtless, full of vague phrases and seriously disturbing to the business interests of the country, there is no excuse and there should be none of it.

"We submit that Congress should refuse to enact any amendment in further regulation of railways which has not been thoroughly discussed before committees and its desirability and necessity demonstrated by an expression of widely entertained opinion and belief that it constitutes a remedy for an existent evil injurious to the public welfare. The mere ambition to insert during the period following public hearings some amendment possibly expressive only of somebody's personal view should be steadfastly resisted."

The bulletin contains a digest of railway bills pending in Congress and the action which has been taken in regard to them.

Storekeepers' Convention.

The Railway Storekeepers' Association will hold its convention at the Planter's Hotel, St. Louis, Mo., May 16-18. The following subjects will be discussed:

"By What Unit of Measure Is the Efficiency of a Storekeeper Properly Determined?" H. C. Pearce, G. S. K., Southern Pacific, San Francisco, Cal.; C. H. Drazy, S. K., C. B. & Q., Aurora, Ill.

"Economy in Mechanical Contrivances for Handling Material." J. F. Slaughter, S. K. M. K. & T., Denison, Tex.

"Economy of the Piece Work System in the Handling of Supplies." D. C. Curtis, piece work inspector, C. B. & Q., Chicago.

American Association of Refrigeration.

The first annual meeting will be held at the Hotel Astor, New York, May 9-10. This association is affiliated with the International Association of Refrigeration, which will hold its second international congress of refrigeration in Vienna, Austria, October 6-12, 1910. The Railroad Refrigerator Service Association of the United States has designated its secretary as an official delegate to attend the second international congress of refrigeration at Vienna.

American Society of Civil Engineers.

At the meeting held on May 4 a paper entitled, "The New York Tunnel Extension of the Pennsylvania Railroad: The Site of the Terminal Station," was presented by George C. Clark, M. Am. Soc. C. E. Another paper, entitled "The Water Supply of the El Paso & Southwestern Railway from Carrizozo to Santa Rosa, N. Mex.," was given by J. L. Campbell, M. Am. Soc. C. E.

Central Railway Club.

The next regular meeting will be held at the Hotel Iroquois, Buffalo, N. Y., on Friday, May 13. F. Darlington, electrical engineer, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., will present a paper entitled "Present Status and Tendencies of Railroad Electrification in America."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 7, 1910; Niagara Falls, Ont.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 18; New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues.; N. Y.; May 31-June 3; Atlantic City.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 25-27; Chattanooga, Tenn.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; May 24-27; Niagara Falls, Ont.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 23-26; Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May 3-7; Cincinnati.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—Fourth Saturday in month; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City.; Third Friday in month; Kansas City.
RAILWAY ASSOCIATION OF SPECIAL AGENTS AND POLICE OF U. S. AND CANADA.—May 10-13; Los Angeles, Cal.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual meeting October 11-13, Atlantic City.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio; May 16-18; St. Louis.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

Edwin B. Grosvenor, acting for the attorney-general, has appealed to the Supreme Court of the United States from the decision of the lower court in the commodity clause case.

Governor Hadley, of Missouri, has sent out circular letters to members of the state legislature asking their opinions as to the advisability of a special session to pass a 2½ cent railway fare law.

An officer of the New York Central says that calculations preparatory to increasing local freight rates are now being made by that company and that new tariffs will be filed, probably to go into effect September 1, or soon thereafter.

The steamer lines between New York and New London, Providence, Fall River and New Bedford announce fares for this season about 25 cents higher than last summer. The through first-class fare between New York and Boston via Fall River, is $4.

The Pennsylvania is to restore the 15-cent differential in the freight rates on coal shipped to the Atlantic seaboard from the Georges Creek region, have secured from the Interstate Commerce Commission for this purpose a modification of the order which was issued some time ago.

The attorney-general of Ohio says that he has possession of the minutes of the Coal Traffic Association, composed of roads in that state, disclosing the action taken by the association to make its transportation rates different to different consignees where, presumably, the circumstances and conditions were not different.

The Erie & Western Transportation Company, operating the Anchor Line, the lake line of the Pennsylvania Railroad, has added a new passenger steamer to its fleet, the "Octorara." The "Octorara" is a sister ship of the "Tionesta" and "Juniata," but has many additional modern improvements. The Anchor Line fleet on the Great Lakes now consists of 14 steamers, with a combined capacity of 50,000 tons.

Temporarily—for a few nights only—the farmers' special train will have to take a back seat. "Fish Planting by a Railroad" is the latest. The Lehigh Valley is helping the fish commissioners of New York and Pennsylvania to stock the streams in these two states with fish. The Pennsylvania commissioner has already sent out 300 cans of trout fry for "planting" along the line of the road. Trained attendants accompany each consignment of fish to see that they are fed at regular intervals and planted scientifically. More than two dozen streams in Pennsylvania, tributary to the Lehigh and Susquehanna rivers, have been stocked with fish year after year.

The New York, New Haven & Hartford has completed revised passenger tariffs, to go into effect June 1, and has filed them with the Interstate Commerce Commission. In accordance with the newspaper announcements made some weeks since, large numbers of local single-ticket rates have been increased by five cents, a change which, evidently, is intended to maintain the rates still at the nominal basis of two cents a mile, while yet in every case giving the benefit of fractions—and a little more—to the company. The tariffs, however, announce other increases which will make a much greater disturbance; advances in the rates on season ticket fares to and from New York. For example, the monthly rate between New York and Mount Vernon, 14 miles, 60 rides, is advanced from $5.60 to $6.75; New York and Stamford, 33 miles, from $9 to $10.80; New York and New Haven, 74 miles, from $16 to $22. The lower of the two rates here given is not the lowest which has hitherto been in force, as the company has sold, also, monthly tickets of its older form, good only six days in a week, for about 10 per cent. less than these rates.

It is announced in Boston that the Boston & Albany proposes to make an advance of 12 per cent. in local passenger fares, which will put the rates on the main line back where they were about three years ago, when they were reduced from 2¼ cents a mile to 2 cents. Officers of the Boston & Maine say that increased rates for the Fitchburg division of that road have already been filed with the Interstate Commerce Commission. This division is parallel to the main line of the Boston & Albany.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama & Vicksburg	143	$96,237	$33,243	$139,253	$16,752	$22,284	$4,158	$43,730	$5,271	$92,195	$47,058	.....	$4,350	$42,708	$21,264
Bangor & Aroostook	546	286,448	50,050	349,085	37,107	34,169	2,851	85,867	12,172	172,166	176,919	.....	1,500	175,419	37,215
Bessemer & Lake Erie	201	416,452	21,985	449,415	53,584	105,163	7,842	124,485	7,234	298,307	151,108	.....	6,000	145,108	114,651
Central New England	278	215,984	23,936	254,548	24,070	19,368	1,153	69,810	2,640	117,041	137,507	.....	11,500	126,007	34,046
Central R. R. of New Jersey	668	1,503,756	339,424	1,933,097	142,162	338,415	27,106	545,435	40,567	1,093,685	839,412	—$6,108	112,410	720,894	—231,610
Chicago & North Western	7,638	4,357,896	1,393,263	6,280,608	470,378	759,458	36,683	2,717,940	117,111	4,101,570	2,179,038	—8,382	290,000	1,880,656	191,185
Chicago, Cincinnati & Louisville	284	98,098	20,208	125,536	20,108	23,368	7,615	66,056	5,769	122,916	2,620	.....	3,410	—790	729
Chicago Great Western R.R.	1,486*	869,778	197,910	1,145,452	124,867	151,015	41,305	511,517	36,429	865,133	280,319	—393	29,043	250,883	.....
Chicago, Peoria & St. Louis	529	166,150	57,564	237,882	20,240	28,777	6,740	67,448	5,298	128,503	26,425	.....	4,500	21,925	9,946
Chicago, Rock Island & Gulf	1,739	950,334	325,294	1,366,660	53,108	22,471	8,983	90,474	8,595	183,631	54,251	—232	8,593	45,426	—86,277
Chic., St. Paul, Minneapolis & Omaha	1,248	719,175	101,258	859,901	154,161	125,546	21,661	490,243	30,882	822,493	544,167	—934	60,895	482,338	166,106
Colorado & Southern	337	129,167	20,182	169,868	124,216	150,615	12,435	289,382	24,520	601,168	258,733	—614	22,219	235,900	85,701
Colorado Midland	162	183,737	42,540	236,260	20,100	34,546	9,882	84,978	5,464	154,970	14,898	—920	8,625	5,353	423
Cumberland Valley	931†	2,040,141	518,580	2,741,983	41,751	36,667	4,164	78,660	6,912	168,154	68,106	478	4,083	64,501	—5,956
Delaware, Lackawanna & Western	369	96,652	24,591	126,636	190,431	444,171	52,944	802,024	55,988	1,545,558	1,196,425	10,915	118,650	1,088,690	—293,202
Detroit & Mackinac	293	110,291	37,398	152,868	15,225	20,212	1,861	35,608	2,850	75,756	50,880	—131	8,000	42,749	—7,483
Duluth, Missabe & Northern	901‡	539,331	89,763	660,216	69,749	79,435	1,214	65,449	10,126	225,973	—73,105	—807	6,207	—80,119	—12,300
El Paso & Southwestern Co.	307	144,674	31,669	186,359	82,763	85,019	7,590	184,140	25,299	384,811	275,405	—799	19,360	255,246	—42,081
Gulf & Ship Island	1,518	663,723	227,640	962,285	34,365	22,162	1,513	50,503	7,816	116,358	70,001	.....	5,263	64,738	20,864
Gulf, Colorado & Santa Fe	350	656,537	63,875	743,472	255,433	148,148	23,609	392,255	32,478	851,923	110,362	.....	35,758	74,604	—110,942
Hocking Valley	175	223,523	24,251	252,167	72,906	150,027	7,407	199,164	14,995	444,499	298,973	1,612	25,258	275,327	187,842
Kanawha & Michigan	827	644,283	121,449	843,827	42,114	62,660	1,766	60,249	3,770	170,559	81,608	2	6,997	74,613	51,629
Kansas City Southern	1,441	2,612,234	337,666	3,047,406	88,716	93,089	25,228	309,422	30,614	547,069	296,758	.....	29,064	267,694	3,733
Lehigh Valley	932	532,767	199,509	774,733	267,531	506,567	73,875	915,534	61,232	1,824,739	1,222,666	—21,626	94,600	1,106,440	120,276
Maine Central	324	110,199	28,460	147,134	72,575	116,695	6,274	270,974	21,623	488,141	286,592	1,486	35,993	252,086	26,175
Midland Valley	365	51,052	20,564	76,718	19,633	22,623	2,100	39,592	5,049	88,997	58,137	—1,071	6,000	51,066	54,272
Missouri & North Arkansas	3,072	1,485,441	629,147	2,261,802	23,525	11,801	1,829	27,940	3,304	68,399	8,319	.....	3,900	4,419	3,721
Missouri, Kansas & Texas	196	247,477	48,869	318,167	404,098	286,193	70,956	938,119	76,441	1,775,807	485,995	8,239	94,744	399,490	—90,995
New Orleans & North Eastern	275§	94,633	29,311	130,258	27,554	43,891	11,166	93,409	12,068	188,088	130,079	.....	8,200	121,879	41,395
New Orleans Great Northern	2,045	2,565,363	1,946,509	4,970,928	19,322	18,154	2,373	31,619	4,880	76,348	53,910	—92	1,250	52,568	38,277
New York, New Haven & Hartford	546	596,238	102,057	720,600	489,167	558,177	31,671	2,022,439	136,206	3,237,660	1,733,268	97,095	350,000	1,480,363	178,349
New York, Ontario & Western	602	201,183	48,664	260,503	71,694	113,115	13,772	275,967	16,696	491,244	229,356	—2,836	16,667	209,853	—17,005
Norfolk & Southern	2,331	1,071,503	268,718	1,446,079	31,347	35,552	3,544	68,580	12,937	151,960	108,543	—348	6,200	101,995	4,304
Pere Marquette	7,050	3,629,643	1,144,679	5,153,645	126,845	183,943	36,334	588,146	29,498	964,766	481,313	11,027	84,625	407,715	62,474
Southern Ry.	171	73,927	33,452	116,380	567,491	986,603	118,990	1,669,204	148,354	3,490,641	1,663,004	—3,490	178,311	1,481,203	175,294
Vicksburg, Shreveport & Pacific					23,538	20,986	4,185	37,927	4,688	91,324	25,057	.....	6,300	18,757	6,173
NINE MONTHS OF FISCAL YEAR, 1910.															
Alabama & Vicksburg	143	$825,660	$354,723	$1,269,636	$188,334	$197,573	$33,805	$389,218	$46,629	$855,559	$414,077	.....	$39,201	$374,876	$133,957
Bangor & Aroostook	546	1,665,223	489,859	2,266,027	332,980	256,915	25,685	623,124	95,559	1,334,263	931,764	.....	13,500	918,264	150,939
Bessemer & Lake Erie	201	5,292,101	250,485	5,620,943	540,900	955,040	66,029	1,388,256	90,150	3,040,375	2,580,568	.....	87,210	2,493,358	852,526
Central New England	278	1,847,054	254,947	2,219,415	357,436	194,866	14,138	659,700	28,411	1,254,551	964,864	.....	68,500	896,364	248,297
Central R. R. of New Jersey	668	13,199,525	3,342,988	17,485,052	1,459,089	2,834,385	258,867	4,767,722	362,773	9,682,836	7,802,216	$185,567	894,848	7,092,935	753,591
Chicago & North Western	7,638	37,341,218	13,917,844	55,734,553	7,931,607	7,058,160	973,832	22,196,296	941,029	39,100,924	16,633,629	—44,114	2,114,000	14,475,515	—1,613,793
Chicago, Cincinnati & Louisville	284	871,715	228,645	1,165,308	206,708	202,795	76,152	544,152	53,324	1,083,131	82,177	.....	30,660	51,517	85,064
Chicago Great Western R.R.	1,486*	5,059,498	1,457,182	7,025,971	789,003	835,261	287,708	3,090,370	239,524	5,241,866	1,784,105	—10,747	191,405	1,581,953	.....
Chicago, Peoria & St. Louis	255	1,101,022	232,661	1,393,553	196,457	273,216	59,280	545,854	46,703	1,121,510	766,713	—2,242	38,400	233,643	113,024
Chicago, Rock Island & Gulf	529	1,663,748	566,880	2,346,621	410,303	182,108	61,636	848,566	77,295	1,579,908	1,028,918	—1,261	57,002	707,470	103,192
Chic., St. Paul, Minneapolis & Omaha	1,739	7,319,678	3,302,521	11,416,173	1,390,324	1,292,960	212,690	4,237,933	253,348	7,387,255	4,411,855	—4,689	489,658	3,537,999	282,775
Colorado & Southern	1,248	5,800,869	1,233,242	7,401,574	956,291	1,181,777	123,937	2,355,617	194,263	4,581,885	2,589,689	—3,928	195,519	2,389,481	381,936
Colorado Midland	337	1,290,937	288,616	1,787,359	215,692	303,073	92,173	786,965	50,988	1,448,891	338,468	—3,928	84,085	250,455	—86,899
Cumberland Valley	162	1,609,538	454,657	2,158,453	290,934	228,863	38,699	648,998	54,681	1,262,175	896,278	4,780	36,753	864,305	58,228
Delaware, Lackawanna & Western	931†	19,786,596	5,201,761	26,616,110	2,199,661	3,634,719	477,905	7,251,927	509,595	14,073,807	12,542,303	218,482	1,160,050	11,600,735	797,078
Detroit & Mackinac	369	634,545	226,753	911,519	145,744	147,314	18,440	293,018	24,910	629,426	282,093	906	78,341	204,658	9,274
Duluth, Missabe & Northern	293	8,964,741	315,368	9,344,989	789,872	780,988	13,626	1,288,458	110,012	2,982,956	6,362,033	27,284	460,261	5,929,056	1,576,933
El Paso & Southwestern Co.	901‡	4,358,082	786,201	5,397,209	758,198	719,168	90,208	1,474,284	206,051	3,247,909	2,149,300	—7,870	181,891	1,959,539	—120,429
Gulf & Ship Island	307	1,195,736	318,233	1,612,257	306,834	260,082	12,099	469,664	66,615	1,115,294	496,963	.....	45,567	451,397	124,380
Gulf, Colorado & Santa Fe	1,518	6,415,150	2,264,634	9,273,478	1,924,040	1,401,317	216,270	3,497,860	276,028	7,315,515	1,957,963	.....	312,234	1,645,729	—1,115,038
Hocking Valley	350	4,940,720	663,776	5,792,220	713,101	1,055,555	67,575	1,605,850	109,835	3,551,916	2,240,304	81,702	195,746	2,126,260	780,521
Kanawha & Michigan	175	1,803,820	238,477	2,082,897	396,401	479,816	19,509	509,092	38,888	1,443,706	639,191	—210	62,176	576,805	292,793
Kansas City Southern	827	5,245,224	1,060,084	7,010,217	774,273	892,660	231,083	2,411,915	270,872	4,580,803	2,429,414	.....	239,972	2,189,442	—93,005
Lehigh Valley	1,441	22,275,469	3,217,186	26,428,555	2,716,968	4,379,827	663,975	7,880,374	533,706	16,174,850	10,253,705	—29,047	851,400	9,373,258	1,464,670
Maine Central	932	4,082,244	2,222,560	6,703,531	938,147	952,455	66,686	2,259,681	197,920	4,414,889	2,288,642	24,523	321,382	1,991,783	330,856
Midland Valley	324	760,050	248,438	1,061,005	166,584	197,079	17,374	294,748	43,330	719,115	341,890	3,903	70,000	275,793	259,581
Missouri & North Arkansas	365	385,095	188,883	614,625	185,900	84,312	14,086	222,772	24,920	531,990	82,635	.....	35,100	47,535	61,737
Missouri, Kansas & Texas	3,072	13,388,640	5,836,551	20,455,567	2,983,756	2,524,242	502,641	7,493,943	665,765	14,170,347	6,285,220	—10,226	820,606	5,454,388	458,671
New Orleans & North Eastern	196	1,911,055	465,448	2,576,411	254,256	394,624	80,671	856,295	95,694	1,681,540	894,871	.....	73,924	820,947	161,530
New Orleans Great Northern	275§	731,934	263,987	1,052,489	184,038	143,469	19,998	266,478	43,668	657,651	394,838	—733	9,450	384,655	351,783
New York, New Haven & Hartford	2,045	22,156,615	18,603,852	44,794,868	4,827,122	4,928,889	234,314	17,117,869	1,139,763	28,247,957	16,546,911	981,854	2,955,000	14,573,765	3,619,453
New York, Ontario & Western	546	4,802,859	1,242,795	6,302,524	800,145	977,332	104,128	2,371,415	150,230	4,403,250	1,899,274	—33,637	150,000	1,715,637	—70,642
Norfolk & Southern	602	1,319,488	512,110	1,970,006	221,110	248,540	34,778	595,799	126,554	1,226,781	743,225	2,166	54,300	691,091	137,929
Pere Marquette	2,331	8,310,370	2,841,373	12,020,887	1,458,589	1,559,317	305,745	4,780,589	267,429	8,371,669	3,649,218	22,269	501,959	3,169,528	567,603
Southern Ry.	7,050	28,885,730	11,114,494	43,335,525	5,067,164	7,380,480	1,036,369	14,193,696	1,296,261	28,973,970	14,361,555	8,332	1,496,313	12,873,574	1,406,352
Vicksburg, Shreveport & Pacific	171	644,902	355,891	1,087,086	196,047	194,001	30,947	319,295	39,882	780,172	306,914	.....	58,718	248,196	42,997

*Began operations on September 1, 1909. †Mileage operated on March 31, 1909, 893 miles. ‡Mileage operated on March 31, 1909, 867 miles. §Mileage operated on March 31, 1909, 91 miles. — Indicates Deficits, Losses and Decreases.

Extensive Advances in Freight Rates West of Chicago.

W. H. Hosmer, representing the principal railways west of Chicago, has filed tariffs at Washington showing substantial increases in a large number of important commodities to go into effect June 1. The tariffs thus far filed have to do only with commodity rates, but it is understood that more general advances will soon be announced. The territory covered is practically all that between Chicago and the Missouri river, including St. Paul and Minneapolis. Taking the tariffs from Mississippi river points to Missouri river points as typical, some of the changes, as given out at the office of the Interstate Commerce Commission, are as follows, in cents per 100 lbs.:

	Old rates.	New rates.
Beer	17 cts.	20 cts.
Enameled brick	12½ "	15 "
Cereal food products	20 "	22 "
Pig lead	6¼ "	8½ "
Hides	30 "	35 "
Steel pipe	13½ "	16 "
Scrap iron	10 "	12 "
Base bullion	12½ "	15 "
Wood pulp	12½ "	15 "

The Chicago, Milwaukee & St. Paul has notified the Interstate Commerce Commission of a general advance in freight rates of from 10 to 20 per cent. This information comes in a despatch from Washington and seems to be a forerunner of similar notices from other roads west of Chicago.

Forged Bills of Lading.

Following the failure of a large cotton buying firm in Alabama—Knight, Yancey & Co.—on April 21, press despatches were printed to the effect that forged bills of lading for shipments of cotton aggregating over $2,000,000 in value had been discovered at New York, Liverpool and other places to which cotton from the southern states had been shipped. These statements are in very general terms, no names, dates or detailed amounts being given; but there seems to be no doubt that large numbers of such papers have been uttered. It appears to be the settled opinion of some of the traffic officers of prominent railways in the southern states that railway companies' blanks have been used a great deal by shippers for the purpose of collecting payments for cotton before the cotton was actually shipped. It seems likely that this has been done by some parties who subsequently covered their tracks, so far as possible, by shipping the cotton called for by the spurious bills of lading, the genuine bills received from the railway for these shipments being then destroyed. In this way a forged bill might be accepted by a railway agent, and, the cotton appearing according to the terms of the bill, the forgery would never be discovered. A prominent cotton man, explaining to a reporter the way in which shipments are mixed at the compresses in the southern states, says:

"Let us say that an eastern firm buys 100 bales at Decatur, another 100 at Macon and a third 100 at Hogan. This cotton is shipped to Atlanta to the compress and local bills of lading are taken from each town to Atlanta. At Atlanta the 300 bales are graded, and, say, 10 bales are taken from Decatur's shipment and 10 from another and mixed. It is graded to suit the market to which it is to be shipped. It is rebaled. Now, the railways have a through rate from Decatur to Liverpool, let us say. So the firm takes the local bill of lading for 100 bales from Decatur and gets in exchange from the railway a through bill from Decatur to Liverpool for 100 bales, when, as a matter of fact, only 10 of the 100 Decatur bales have been used. When this is repeated indefinitely it can be seen what possibilities there are for fraud.

"Then again business here is done largely on credit, on the honesty of the shippers. A shipper gets blank bills of lading from a railway agent and coolly forges the agent's signature to them. Cotton is sold altogether on bills of lading. Hence the bills are negotiable paper in any cotton market. Let the shipper be a big one. Let him tell the agent that he has cotton to ship and requires five cars at once. It is possible that the cars are not available at once. So, to satisfy the shipper, the agent may prepare bills of lading for the cotton to be shipped, and it may never be shipped. But the bills may be negotiated at any cotton center."

INTERSTATE COMMERCE COMMISSION.

The commission has granted a petition for the reargument of the case of W. J. Jennison Co. et al. v. Great Northern et al., which case was decided March 15, and the order reducing the rate on flour from Minneapolis to New York from 23 cents to 21½ cents per 100 lbs. was made effective May 10. Pending the reargument the effective date of the order will be suspended.

Rates on Salt Unreasonable.

Delray Salt Co. v. Michigan Central et al. Opinion by Chairman Knapp.

Rate from Detroit, Mich., to Buffalo, N. Y., and New York City found unreasonable. (18 I. C. C., 268.)

Rate on Steam Shovel K. D. Reduced.

Vulcan Steam Shovel Co. v. Missouri Pacific et al. Opinion by Commissioner Clements.

The shipper who tenders a shipment which should move under one bill of lading cannot be required to pay higher charges because he yields to the demand of the carrier's agent to have two bills of lading made. In this case two bills of lading were issued on a steam shovel which started on its journey completely set up, but accompanied by a car to carry parts not attached, and later the shovel was taken apart and loaded on to the car. (18 I. C. C., 265.)

STATE COMMISSIONS.

The Illinois State Railway Commission has given notice that it will hold a hearing in Chicago on May 5, when the railways of the state will be required to show cause why the commission should not reduce its present schedule of maximum rates on coal. The railways recently advanced coal rates in Illinois, but left them substantially lower than the commission's own maximum schedule.

The Public Service Commission of New York, First district (New York City), has been enabled, by a law which has just been passed, to authorize the construction of moving platforms. This is understood to assure the construction of the moving platform under Thirty-fourth street, Manhattan, the privilege for which was applied for by the Continuous Transit Securities Co. some months since. (Dec. 10, 1909, p. 1155.)

The Texas Railway Commission on April 29 issued an emergency order, requiring the railways operating lines to the Gulf in Texas to continue to absorb loading charges at Texas ports on foreign and domestic traffic destined to interior points in Texas. Some time ago the railways issued tariffs announcing that they would discontinue the absorbing of port loading charges. The commission will give a hearing on May 10 to whether it shall issue an order requiring the permanent continuance of this practice or allowing its discontinuance and making such reductions in the carload rates from the ports as will off-set the discontinuance of the absorption of the loading charges.

Refund Ordered.

Somo River Lumber Co. v. Wisconsin & Northern; Minneapolis, St. Paul & Sault Ste. Marie, and Chicago, Milwaukee & St. Paul.

Complainant asks refund on shipment of lumber which took a rate equaling the sum of locals while a competing line had a lower rate in effect. Since the movement of the shipment the through rate has been put in effect. The application of the complainant is granted.

Osceola Mill & Elevator Co. v. Minneapolis, St. Paul & Sault Ste. Marie.

Petition alleges overcharges on certain shipments of rye and barley from various points in Wisconsin to Osceola, Wis. The rate contended for had been agreed on between the parties, but the respective tariff was not made effective until after the shipments had moved.

*Began operations on September 1, 1909. †Mileage operated on March 31, 1909, 893 miles. ‡Mileage operated on March 31, 1909. Indicates Deficits, Losses and Decreases.

Held that the rates exacted were unusual and exorbitant under the circumstances.

New Richmond Roller Mills Co. v. Chicago, St. Paul, Minneapolis & Omaha.

In this case it is alleged that certain grain shipments stopped at Hudson for storage and cleaning were charged the sum of the local rates; that such charges are unreasonable and that the through rate with stoppage in transit privilege should have applied, for the reason that such rates were in effect prior to the shipments and were made effective subsequent to such shipments, and that Hudson is practically in the same situation as other points enjoying such rates.

The rate exacted was unusual and exorbitant and refund ordered.

Joint Rate Ordered.

City of Neenah v. Wisconsin Traction, Light, Heat & Power Co., Wisconsin Electric Railway.

This petition asks the commission to order the respondent street railways to establish joint rates within the city of Neenah. The power of the commission to establish such joint rate is denied by the respondent on the ground that there is no mechanical union of tracks, and that, therefore, respondents are not connecting carriers. By stipulation this question was submitted for determination in advance of the investigation into the merits of the case.

It is held that carriers may form connecting lines for the purpose of interchange of traffic although no mechanical union of tracks exists. The objection is overruled.

COURT NEWS.

The Supreme Court of the United States, in decisions issued this week, has sustained the anti-trust laws of Mississippi and Tennessee.

The United States circuit court at Guthrie, Okla., has temporarily enjoined officers of the state of Oklahoma from collecting from the Atchison, Topeka & Santa Fe and the Missouri, Kansas & Texas the state tax levied on them for 1908 and a portion of the local taxes. The railways allege that the state board of equalization reduced the assessment on all other property below its fair cash value but left the assessment of the railways at their fair cash value.

The Chicago & Alton has been indicted at Kansas City by a federal grand jury on a charge of having on April 2, 1908, sold thirty-three round-trip tickets from Kansas City to Chicago for $12.50, the second class rate, and allowed the passengers holding them the privileges of first class passengers in sleeping and parlor cars. It is also alleged that ten persons were sold second class tickets and allowed first class privileges on November 7, 1908, and that at later dates 16 other persons were sold second class tickets and given privileges to which under the law their tickets did not entitle them.

The Indiana Supreme Court has rendered a decision upholding the so-called Carmack section of the Interstate Commerce law. A man named Daniel J. Mitchell shipped a carload of apples from Dureith, Indiana, to Smyrna, Fla. He prepaid the freight to the C., C., C. & St. L., the initial carrier. The road gave him a bill of lading limiting its liability to damages occurring on its own line. The apples were delayed 19 days on the road and were practically a dead loss to Mitchell, and he sued the Big Four for the damages, which had taken place on connecting lines. The court held that a railway which accepts a shipment to be transported to another state on another line cannot defend an action in a state court by a bill of lading relieving it from liability beyond its own line. It said that a state court has a right to guarantee a citizen all his rights under a federal statute, and it is only when a federal statute is the foundation of the action that the federal courts have exclusive jurisdiction to construe it. If a shipper does not have an opportunity to consign his goods subject to the common law liability of the carrier, the carrier cannot set up a limited liability and compel the shipper to send his goods subject to it or not ship at all.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. I. Miller, until recently president of the Chicago & Eastern Illinois, has been appointed receiver of the Buffalo & Susquehanna.

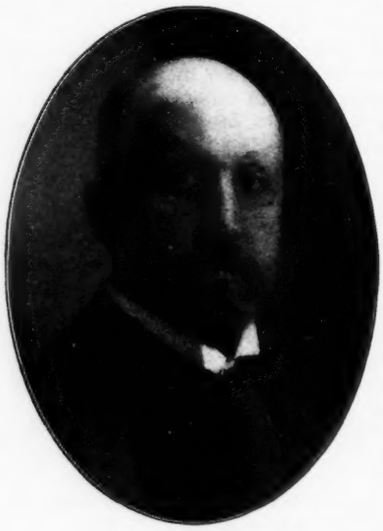
Charles Jensch has been appointed general auditor of the Chicago, St. Paul, Minneapolis & Omaha, with office at St. Paul, Minn.

D. E. Schuckhart, auditor of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex., has resigned. D. W. McLeod, chief clerk in the auditor's office, has been appointed acting auditor.

B. P. Waggener, general attorney of the Missouri Pacific for northern, eastern and central Kansas and Nebraska, has been appointed general solicitor for Kansas, Nebraska and Colorado, with headquarters at Atchison, Kan.

A. L. Conrad, auditor of disbursements of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed assistant general auditor with office at Chicago. E. H. Bunnell, Mr. Conrad's chief clerk, has been appointed acting auditor of disbursements.

Marshall M. Kirkman, whose retirement from the position of vice-president of the Chicago & North Western has been announced in these columns, was born July 10, 1842, in Morgan county, New York. He began railway work in 1856 as messenger boy for the Chicago & North Western, and was with that company continuously until his resignation. In 1860 he was made train despatcher of the road, which at that time only extended from Chicago to Oshkosh, Wis. Later he dropped operating and train despatching to take charge of all freight accounts, and little by little all the accounts of the company were given into his charge. In 1870 the local finances of the company were also entrusted to him and the accounts and finances remained thus jointly in his charge from 1870 to the date of retirement. In 1889 he was appointed chairman of the committee of railway accounting officers to act with the Interstate Commerce Commission's representative in harmonizing railway accounts with the various departments of the government. He was also made a member of the committee of 25 on "corporate, fiscal and general accounts," which has practically secured uniformity of railway accounts. He was active in forming, and was made the first president of the Association of American Railway Accounting Officers, which has done much towards securing closer co-operation in the handling of interline traffic. As early as 1861 Mr. Kirkman commenced editing a railway manual for his own use, and more than ten years later the manuals that had been prepared were published in book form by the *Railroad Gazette*. In 1896 he issued the "Science of Railways" in 17 volumes, a work which is still on the market. Mr. Kirkman is also the author of several novels, the first being a story of Illinois, "The Romance of Gilbert Holmes." It is an historical novel, having among its characters Abraham Lincoln, Stephen A. Douglas and Blackhawk. His last publication, in 1909, was the "Alexandrian Novels," three romances under the titles, "Alexander the Prince," "Alexander the King" and "Alexander and Roxana."



M. M. Kirkman.

The books include historical notes giving a complete account of Alexander's life.

Operating Officers.

M. B. Bayer has been appointed supervisor of transportation of the Oregon & Washington, with office at Tacoma, Wash.

A. E. Campbell has been appointed trainmaster of the Musselshell division of the Chicago, Milwaukee & Puget Sound, with office at Miles City, Mont.

J. H. Fraser, general superintendent of the Detroit, Toledo & Ironton and the Ann Arbor at Toledo, Ohio, has resigned from his position with the latter road.

E. E. Betts, car service agent of the Chicago & North Western, has been appointed superintendent of transportation, with office at Chicago, the position of car service agent having been abolished.

George Masten, chief train despatcher of the Seaboard Air Line at Richmond, Va., has been appointed a trainmaster, succeeding A. Ramseur, resigned. R. C. Watkins succeeds Mr. Masten, with office at Richmond.

W. E. Watt, assistant trainmaster of the Grand Trunk at Richmond, Que., having resigned, that position has been abolished, and all reports previously made to the assistant trainmaster will in future be made to J. J. Connelly, trainmaster at Island Pond, Vt.

W. T. Stewart, purchasing agent and general superintendent of the Gulf & Ship Island, has been appointed superintendent. Mr. Stewart will be in charge of the operating and purchasing departments, reporting to the first vice-president, his former position having been abolished.

Winslow T. Perkins, superintendent of the Eastern division of the Boston & Maine, at Boston, Mass., having resigned, the jurisdiction of William Merritt, superintendent of the Western division, at Boston, has been extended over the Eastern division, which will be combined with the Western division.

C. B. Gorsuch, trainmaster of the Pittsburgh division of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed superintendent of the Wheeling division, with office at Wheeling, W. Va., succeeding O. Rickert, resigned. M. H. Cahill, division operator of the New Castle division, succeeds Mr. Gorsuch, with office at Pittsburgh.

Robert Finney, general superintendent of the Pittsburgh system of the Baltimore & Ohio, at Pittsburgh, Pa., has been appointed general agent at Pittsburgh, and W. C. Loree, general superintendent of the Wheeling system, has been transferred to the Pittsburgh system. U. B. Williams, superintendent of the Monongah division, at Grafton, W. Va., succeeds Mr. Loree. H. R. Laughlin, trainmaster at Grafton, succeeds Mr. Williams.

The operating department of the Chesapeake & Ohio having been reorganized, the following changes have been made: C. E. Doyle, vice-president and general manager, has been appointed vice-president, in charge of operation; E. W. Grice, general superintendent, West Virginia general division, at Hinton, W. Va., has been appointed general manager; E. P. Goodwin, general superintendent, Kentucky general division, at Covington, Ky., succeeds Mr. Grice, and J. P. Stevens, superintendent of the Cincinnati division, at Covington, succeeds Mr. Goodwin. C. C. Walker, superintendent of transportation, at Richmond, Va., has been appointed general superintendent of transportation.

John J. Driscoll, whose appointment as superintendent of the Cumberland division of the Baltimore & Ohio, with office at Cumberland, Md., has been announced in these columns, was born in 1866 and entered the service of the Baltimore & Ohio as a telegraph operator in March, 1882, at Pittsburgh, Pa. In August, 1886, he was made train despatcher, and was promoted to night chief despatcher in June, 1896. The following August he was transferred to the Connellsville division as chief train despatcher and division operator. He was promoted to assistant trainmaster at Rockwood, Pa., February 1, 1902, and in June of the following year was made trainmaster of the Connellsville division. He was appointed superintendent of the Connellsville division in December, 1906, which position he held at the time of his recent appointment as superintendent of the Cumberland division.

Thomas J. Foley, assistant to the vice-president and general manager of the Illinois Central, has been appointed assistant general manager, with office in Chicago. Mr. Foley was born on August 26, 1866, at Convoy, Ohio, and began railway work as a telegraph operator on the Pennsylvania Lines West, December 20, 1878. He served the Pennsylvania in various positions, resigning as transportation inspector in 1901 to become assistant to the general manager of the Baltimore & Ohio. He served as superintendent of the Chicago division and general superintendent of the Wheeling system of the Baltimore & Ohio, resigning the latter position in 1905 to become chief despatcher of the Union Pacific. In 1907 he was appointed superintendent of the Omaha terminals of that company, which position he resigned March 15, 1910, to become assistant to vice-president of the Illinois Central.

John M. Daly, whose appointment as general superintendent of transportation of the Illinois Central, with office at Chicago, has been announced in these columns, was born June 18, 1863, at Peoria, Ill. He began railway work as a clerk on the Toledo, Peoria & Western on April 1, 1877, and later held similar positions with the Wabash and the Chicago & North Western. In 1885 he was appointed car accountant of the Chicago Great Western at St. Paul, Minn., and in 1888 he became assistant general superintendent of that company. He resigned that position to become car accountant of the New York, Chicago & St. Louis at Cleveland, Ohio. In 1889 he became superintendent of transportation of the Illinois Central and later served in the same position with the Delaware, Lackawanna & Western. In 1901 he was appointed inspector of transportation on the government railways of Canada and in 1902 he again became superintendent of transportation of the Illinois Central, with office at Chicago. In 1906 he was appointed car accountant, which position he held until his recent appointment as general superintendent of transportation.

John M. Daly.

Traffic Officers.

C. L. Hogan, commercial agent of the Chicago Great Western at Kansas City, Mo., has resigned to go into other business.

Oscar L. Hill has been appointed passenger traffic agent of the Illinois Traction Company, with office at Springfield, Ill.

Alex. C. Johnson has been appointed passenger traffic manager of the Chicago & North Western, vice Warren B. Kniskern, resigned.

James S. Etchberger, traveling passenger agent of the Seaboard Air Line at Columbia, S. C., has been transferred to Savannah, Ga.

H. E. Thatcher, general agent of the Hocking Valley at Cincinnati, Ohio, has been appointed general agent at Toledo, Ohio, succeeding J. F. Youse, resigned.

E. B. Butterworth has been appointed traveling freight agent of the Cincinnati, Hamilton & Dayton, reporting to the division freight agent at Toledo, Ohio.

The title of F. M. Whitaker, vice-president and traffic manager of the Chesapeake & Ohio, at Cincinnati, Ohio, has been changed to vice-president in charge of traffic.

J. F. Beyer has been appointed a traveling passenger agent of the Illinois Central, with office at Dubuque, Iowa, succeeding J. F. Jackson, resigned, to go to another company.

John V. McCarty, soliciting freight agent of the Nashville, Chattanooga & St. Louis at St. Louis, Mo., has been appointed

a commercial agent, with office at St. Louis, succeeding W. C. Bates, resigned.

C. H. Ogilvie, commercial freight agent of the Missouri Pacific-Iron Mountain system, at Cairo, Ill., has been appointed soliciting freight agent at Dallas, Tex., succeeding T. V. Murray, Jr., resigned, as previously announced in these columns.

J. H. Burgis, city passenger and ticket agent of the Grand Trunk at Chicago, has been appointed general agent, passenger department, in charge of the states of Washington, Oregon and Idaho, of the Grand Trunk, the Grand Trunk Pacific, and the Grand Trunk steamship lines, with office at Seattle, Wash.

Oscar A. Constans, who has been appointed western freight traffic manager of the Baltimore & Ohio, in general charge of freight traffic of the lines west of the Ohio river, and of the Baltimore & Ohio Chicago Terminal Co., with office at Chicago, was born at Columbus, Ohio, on November 23, 1862. Mr. Constans was educated in the grammar and high schools of Columbus, and began railway work in the freight office of the Baltimore & Ohio at Columbus in 1883, since which time he has been in continuous service with that company. In May, 1884, he was made secretary to C. S. Wright, then assistant general freight agent, and on May 15, 1891, was promoted to chief clerk of the freight department at Pittsburgh. About four years later he was made division freight agent at the same place. He was transferred in May, 1897, to Columbus, as division freight agent, and on June 1, 1902, was appointed division freight agent at Cleveland. Mr. Constans was appointed general freight agent at Pittsburgh on February 1, 1907, which position he held at the time of his recent appointment.

O. A. Constans.

J. B. Parker, eastern traffic agent of the Central of Georgia at New York, has been appointed assistant general freight agent, with office at Savannah, Ga. W. C. Bates succeeds Mr. Parker, with office at New York. O. C. Pope has been appointed a soliciting agent, with office at Birmingham, Ala., succeeding C. E. Henson, resigned.

B. H. Coyle, commercial agent of the Wabash Railroad at St. Louis, Mo., has been appointed general agent of the freight department, with office at St. Louis. J. B. Hayes, commercial agent at Alton, Ill., has been appointed commercial agent at East St. Louis, in charge of freight and passenger business from Poag, Ill., to East St. Louis and Belleville.

Engineering and Rolling Stock Officers.

F. M. Corbett, trainmaster of the Chicago & Alton at Springfield, Ill., has been appointed roadmaster.

W. H. Gardner, Jr., superintendent of roadway of the Gulf & Ship Island, has been appointed chief engineer, his former position having been abolished.

J. J. Connors, district master mechanic of the Chicago, Milwaukee & St. Paul at Dubuque, Iowa, has been appointed assistant superintendent of motive power for the lines west of the Mississippi river.

The title of F. J. Stimson, engineer maintenance of way of the Grand Rapids & Indiana, at Grand Rapids, Mich., and of C. L. Barnaby, engineer maintenance of way at Fort Wayne, Ind., has been changed to division engineer.

A. J. Isaacks, master mechanic of the Chicago Great Western at Clarion, Iowa, has been appointed master mechanic of the southern division with headquarters at Des Moines, Ia., succeeding T. H. Yorke, resigned. J. W. Johnson, locomotive foreman at Oelwein, Ia., succeeds Mr. Isaacks.

The engineering department of the Chesapeake & Ohio having been reorganized the following changes have been made: F. I. Cabell, engineer maintenance of way at Richmond, Va., has been appointed chief engineer maintenance of way; F. B. Isaacs, division engineer at Richmond, has been appointed engineer maintenance of way of the Virginia general division; C. W. Johns, assistant engineer maintenance of way at Hinton, W. Va., has been appointed engineer maintenance of way of the West Virginia general division, and L. B. Allen, division engineer at Ashland, Ky., has been appointed engineer maintenance of way of the Kentucky general division.

John T. Wilson, assistant engineer of the Baltimore & Ohio at Baltimore, Md., has been appointed district engineer, with jurisdiction over the territory between Philadelphia, Pa., and the Ohio river at Parkersburg, W. Va., and Wheeling, with office at Baltimore. R. N. Begien, division engineer maintenance of way of the Philadelphia division at Philadelphia, has been appointed assistant to the chief engineer, with office at Baltimore, and E. T. Brown, division engineer maintenance of way of the Shenandoah division at Winchester, Va., succeeds Mr. Begien, with office at Philadelphia. G. T. Warren, assistant division engineer at Cumberland, Md., succeeds, Mr. Brown, with office at Winchester.

Leigh G. Curtis, whose appointment as engineer maintenance of way of the Northwest system of the Baltimore & Ohio and Baltimore & Ohio Chicago Terminal, with office at Chicago, has been announced in these columns, was born at Hamilton, Ohio, on November 28, 1864. Mr. Curtis graduated from the Ohio State University as civil engineer in 1899 and began railway work with the Baltimore & Ohio as civil engineer at Zanesville, Ohio, the same year. In 1900 he was made assistant engineer of the Wheeling & Lake Erie at Cleveland, Ohio, returning to the Baltimore & Ohio in 1901 as assistant engineer at Zanesville. He was then for one year assistant division engineer at Garrett, Ind., and in 1903 became division enginer maintenance of way at Chicago, from which position he has just been promoted.

The motive power department of the Chesapeake & Ohio having been reorganized the following changes have been made: J. F. Walsh, superintendent motive power at Richmond, Va., has been appointed general superintendent of motive power; J. R. Gould, master mechanic at Richmond, has been appointed superintendent of motive power of the Virginia general division; C. H. Terrell, master mechanic at Huntington, W. Va., has been appointed superintendent of motive power of the West Virginia general division, and W. T. Smith, master mechanic at Covington, Ky., has been appointed superintendent of motive power of the Kentucky general division. W. P. Hobson, master mechanic of the Ashland division at Lexington, Ky., has been appointed master mechanic of the Cincinnati division, succeeding W. T. Smith, and E. A. Murray, foreman machine department at Covington, succeeds Mr. Hobson.

D. J. Brumley, whose appointment as engineer of construction of the Illinois Central was announced in our issue of April 29, page 1118, was born on March 19, 1865, near Leipsic, Ohio. He graduated in civil engineering from the Ohio State University in June, 1895, and at once entered railway work as assistant section foreman on the Louisville & Nashville. He soon became assistant engineer of the Columbus & Hocking Coal & Iron Co., and after a short time returned to the Louisville & Nashville as assistant supervisor. He held a number of positions in the engineering department of this road, being appointed assistant engineer of the Louisville and Cumberland divisions in 1899. In 1901 he served for a short time as roadmaster on the Mexican Central, but again returned to the Louisville & Nashville, becoming roadmaster of the Main Stem, first division. He was appointed in 1904 division engineer of the Indianapolis Southern and in 1905 principal assistant enginer of the Indianapolis Southern, the Illinois Central and the Yazoo & Mississippi Valley, which position he held until his recent appointment as engineer of construction of these lines.

Purchasing Officers.

J. H. Waterman, storekeeper of the Chicago, Burlington & Quincy at Lincoln, Neb., has been appointed superintendent of timber preservation, with offices at Galesburg, Ill., succeeding F. J. Angier, resigned. J. H. Ellis succeeds Mr. Waterman.

G. L. Pollock, purchasing and supply agent of the Wheeling & Lake Erie at Cleveland, Ohio, has been appointed purchasing agent of the Chicago & Western Indiana and the Belt Railway of Chicago, in charge of the purchasing and supply departments, with office at Chicago, effective May 9, succeeding C. C. Nash, assigned to other duties. Mr. Pollock was born December 8, 1874, at Burlington, Ia. From May 9, 1892, to November 1, 1904, he was in the purchasing department of the Chicago, Burlington & Quincy, and after a short period of service with a manufacturing company was made chief clerk of the purchasing department of the Wabash. He resigned that position on May 1, 1906, to become purchasing agent of the Wheeling & Lake Erie, and on Feb. 1, 1909, his jurisdiction was extended over the supply department of that company. J. F. Marshall, general storekeeper of the Wheeling & Lake Erie at Canton, Ohio, succeeds Mr. Pollock.

OBITUARY.

Isaac Bond, for many years a master mechanic on the Erie Railroad, died recently at his home in Hornell, N. Y., at the age of 70 years.

G. B. Reeve, former vice-president and general manager of the Grand Trunk Railway of Canada, died at his home at La Mirada, in southern California, on May 1. Mr. Reeve was born October 23, 1840, in the county of Surrey, England, and began railway work in 1860 as a freight clerk on the Grand Trunk. About two years later he was made a telegraph operator and the following year he was appointed train despatcher. He was later agent and then assistant general freight agent, and in 1881 he was appointed traffic manager of the company's western line (the Chicago & Grand Trunk). This office he held for 15 years, and in the last six years of the period he was also traffic manager of the Chicago, Saginaw & Mackinaw. In 1896 he was appointed general traffic manager of the Grand Trunk system, and in December, 1900, was made second vice-president and general manager.

General Edward P. Alexander, former president of the Central Railroad & Banking Co. of Georgia, died at Savannah, Ga., on April 28. General Alexander was born May 26, 1835, in Wilkes county, Ga., and was educated at the United States Military Academy at West Point, N. Y. He began railway work in May, 1871, as superintendent of the Charlotte, Columbus & Augusta, now a part of the Southern Railway. He held this office for a year, and then for three years was president of the Savannah & Memphis, now a part of the Central of Georgia. From May, 1875, to July, 1878, he was president of the Western Railway of Alabama, and then for two years was president of the Georgia Railroad & Banking Co. For one year (1880) he was vice-president of the same company, and from May, 1880, to July, 1882, he was also vice-president of the Louisville & Nashville. In 1882 for a short time he was president of the Central Railroad & Banking Co. of Georgia, and was again chosen president of that company in January, 1887, holding the office until March, 1892. From November, 1887, to April, 1892, he was also president of the Port Royal & Augusta and the Port Royal & Western Carolina railways, now the Charleston & Western Carolina. At the outbreak of the war in 1861 he resigned as second lieutenant in the United States Engineer Corps and entered the Confederate army. He served through the war, becoming brigadier general and chief of artillery. At Gettysburg he directed Lee's artillery. From 1866 to 1870 he was professor of mathematics and engineering at the University of South Carolina. In 1887 he wrote a book, "Railway Practice," published by Putnams, dealing briefly with the economic questions then before Congress and the public. General Alexander was a daring and brave soldier, an upright, honest and high minded trustee of others' property, and a public spirited citizen in the best sense of the term. In private life he won innumerable friends by his amiable and sincere character, and those who were his associates in the railway world speak of him in the highest terms.

Railway Construction.

New Incorporations, Surveys, Etc.

ATLANTA, BIRMINGHAM & ATLANTIC.—According to press reports, this company will have the extension from Bessemer, Ala., northeast to Birmingham, 10 miles, finished soon, and the company will be operating trains over its own line into Birmingham, about May 20. (Dec. 3, p. 1106.)

BOSTON & ALBANY.—This company is planning to carry out improvements during 1910 to cost $1,971,700. The work includes a new station and eliminating the grade crossings in Worcester, Mass., to cost $400,000. A large amount of money is to be spent enlarging the freight yards at East Cambridge, Mass.; Natick, South Braningham and at Westfield. There will also be a large amount of bridge renewal work, the construction of a third track between Greenbush and Rensselaer and an addditional two-track tunnel at State Line.

CANADIAN PACIFIC.—Construction work will probably be carried out this year on the line which has been located from Merritt, B. C., to Penticon, about 75 miles, in the southern end of the Okanagan valley.

CHICAGO, MILWAUKEE & PUGET SOUND.—This company has bought property in Spokane, Wash., for a terminal, at a cost of $2,000,000, and will build a 25-mile branch from the main line north to Spokane, at a cost of about $500,000. A large number of additional branch lines are also to be built. The Chicago, Milwaukee & St. Paul will carry out a large amount of double-tracking and enlargements of yards and terminal facilities and will also make other improvements.

According to press reports, this company is buying land for right-of-way along North river, Wash., which indicates that a branch will be built from the Grays Harbor & Puget Sound, at Cosmopolis, south to Willapa bay, and thence to Portland, Ore.

CHICAGO, MILWAUKEE & ST. PAUL.—See Chicago, Milwaukee & Puget Sound.

CHICAGO, ROCK ISLAND & GULF.—According to press reports, the cut-off built under the name of the Tucumcari & Memphis, from Amarillo, Tex., west to Tucumcari, N. Mex., 110 miles, will be opened for traffic soon. (Nov. 26, p. 1036.)

DAUPHIN ISLAND RAILWAY & HARBOR CO.—Organized in Alabama to carry out dredging work in lower Mobile bay and Dauphin bay, and provide a coaling station at that point. The company also intends to build a railway from the island to the mainland at Cedar Point, which will eventually be extended north to Mobile, or connect with an existing road at a point south of Mobile. George T. Bishop, president and treasurer, Cleveland, Ohio.

DAWSON LUMBER CO. ROAD.—According to press reports from Libby, Mont., a logging line is now in operation from Libby for eight miles, and plans are being made to build a six-mile extension to the mines south of Libby.

DELAWARE, LACKAWANNA & WESTERN.—An officer writes that a contract has been given to Timothy Burke, Scranton, Pa., for change of alinement on the section between Analominck, Pa., and Henryville. The work involves the excavation of about 198,500 cu. yds. of earth and 54,000 cu. yds. of rock, as well as the construction of 20,500 cu. yds. of concrete masonry.

DENVER, KINGFISHER & GULF.—The Chamber of Commerce of Oklahoma City, Okla., has given this company a bonus of $100,000 and work is to be started within 30 days on the line. The projected route is from Oklahoma City northwest to Denver, Colo. Shops and terminals are to be built at Oklahoma City. W. M. Bonson, Dubuque, Iowa, and C. G. Jones, Oklahoma City, are said to be interested.

DENVER, LARAMIE & NORTHWESTERN.—Track laying is now in progress on the extension under construction north via Greeley, Colo. It is expected to have the section completed and in operation to Greeley by May 15. (April 8, p. 970.)

ELIZABETHTOWN TERMINAL.—An officer writes that the proposed route is from Westport, N. Y., on the Delaware & Hudson, west to Elizabethtown, in Essex county, eight miles. The company will build two frame combination freight and pas-

senger stations, one combined roundhouse and machine shop, and some smaller structures. V. R. Coon, general manager, Elizabethtown. (Nov. 19, p. 989.)

Elkton, Fairhill & Oxford Railway & Power Co.—Incorporated in Maryland, with $50,000 capital, to build an electric line from Elkton, Md., north via Cherry Hill, Fairhill and Lewisville, Pa., to Oxford, about 16 miles. H. Hess, Elkton, may be addressed.

Gainesville, Oklahoma & Western.—Construction contracts are to be let this month, it is said. Preliminary surveys have been made from Gainesville, Tex., southwest to Bridgeport, 54 miles. J. Whaley, president; F. B. Truax, chief engineer, Gainesville. (April 1, p. 972.)

Gulf, Colorado & Santa Fe.—A contract is said have been given to W. F. Barbour & Sons for building a four-mile section east from Brady, Tex., on the extension from Lometa west to Brady. (Feb. 25, p. 429.)

A contract is said to have been given to the A. M. Moore Construction Co., Kansas City, Mo., for building the branch from San Angelo, Tex., northwest to Sterling City, about 50 miles. (See Atchison, Topeka & Santa Fe, Feb. 25, p. 428.)

Houston & Bay Shore Traction.—Under this name an electric line is to be built from Houston, Tex., east to La Porte, about 25 miles. The company expects to secure a charter in the near future and begin work in about 60 days. The principal promoter is A. F. Irvin, Detroit, Mich.

Kansas City Union Traction.—An officer writes that surveys have just been made and maps and profiles are being prepared for a line from Parsons, Kan., south via Altamont to Edna, thence west via Valeda to Coffeyville, about 40 miles. The work will include one steel bridge. A power house and a car barn are to be built at Altamont. Barney McDaniel, secretary; Archer, Rollins & Co. are the consulting engineers, Kansas City, Mo.

Kansas, Lawton & Gulf.—According to press reports, work has been started at Walter, in Comanche county, Okla. The company was organized to build from a point in Comanche county north via Oklahoma City to the Kansas state line. Plans made to also build a line from Comanche county south to Wichita Falls, Tex. The office of the company is at Walter. Dr. A. W. Green, president; J. M. Bellamy, vice-president, Lawton. (Feb. 18, p. 379.)

Lake Shore & Michigan Southern.—An officer writes that the only double-tracking work now being carried out is on the old Oil City branch between Sandy lake, Pa., and Polk junction, nine miles.

Lehigh Valley Transit.—See Philadelphia & Western.

Louisiana-Texas Roads.—According to press reports, J. C. Whitney, Carthage, Tex., associated with the Commercial Club of that place, is back of a project to build a line from Shreveport, La., west to Longview, Tex., thence southwest via Henderson, Jacksonville, Fairfield and Mexia to Waco, about 240 miles.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes that a grading contract has been given to Foley, Welch & Stewart for work on the cut-off from New Richmond, Wis., west to Withrow, Minn., 17 miles. Contract for the bridge over the St. Croix river has not yet been let. According to press reports, bids for building the bridge are wanted May 7, and about May 15 contracts will be let for 4,500 tons of structural steel for the bridge, which is to be 2,680 ft. long, 185 ft. above the river, and will cost about $600,000. (April 29, p. 1114.)

Montreal, Kapatchewan & Rupert Bay.—Organized to build from Montreal, Que., northwest to the main line of the Grand Trunk Pacific, about 194 miles. Surveys are being made. The line will traverse the counties of Maisonneuve, Jacques, Cartier, Laval, Two Mountains, Argenteuil, Labelle, Wright and Pontiac. H. Gervais, T. Berthiaume and other residents of Montreal are interested in the project.

Muskogee Transit Co.—According to press reports from Guthrie, Okla., a charter has been granted this company, with $100,000 capital. The plans call for building about 225 miles of electric interurban lines through the counties of Muskogee, Wagoner, Tulsa, Creek, Okmulgee, McIntosh, Sequoyah and Cherokee in Oklahoma. The incorporators include: E. W. Mangson, O. J. Barwick, St. Louis; T. Bixby, T. P. Smith, Muskogee, and O. D. Revell, Asheville, N. C.

North Jersey Rapid Transit Co.—This company has filed an amendment to its charter, increasing the capital stock from $1,000,000 to $2,000,000, and has filed a map showing the surveyed route for the line. Work is now under way from Paterson, N. J., via Glen Rock and Ridgewood to Hohokus, and the line will eventually be extended to Allendale and Suffern, N. Y., about 15 miles. Wm. Barbour, president, Paterson.

Northwestern Railroad.—See Oregon Short Line.

Oregon Short Line.—According to press reports, work is to be started soon on an extension of the Northwestern Railroad, building from Huntington, Ore., north along the Oregon-Idaho state line, following the Snake river to Lewiston, Idaho. The line is already finished as far as Homestead, Ore., and this section is to be turned over to the operating department in a short time. (March 11, p. 547.)

Oregon Trunk Line.—According to press reports, a contract has been given to H. C. Henry, Seattle, Wash., to build from Madras, Ore., south to the northern boundary of the Klamath Indian reservation, 125 miles. (April 29, p. 1114.)

Philadelphia & Western.—A syndicate, represented by Edward B. Smith & Co., is said to have secured control of the property and rights of this company, operating a 11.5-mile line from Philadelphia, Pa., west to Strafford. Plans are said to be made for building a connecting line from a point on the P. & W. near Bryn Mawr, Pa., north via Conshohocken and Norristown to the Lehigh Valley Transit Co.'s line near North Wales, about 20 miles. The work will include putting up a bridge over the Schuylkill river near Conshohocken. The cost of the new line will be about $2,000,000.

Quanah, Acme & Pacific.—An officer is quoted as saying that surveys are being made for an extension from Paducah, Tex., southwest to El Paso, about 550 miles. Of this 125 miles will be through New Mexico. Application has been made for authority to register $388,000 of bonds for the completed line from Quanah south to Paducah, 38 miles. (March 25, p. 850.)

Quanah, Seymour, Dublin & Rockport.—An incorporator writes that the prospects of building this line are good. It is expected that grading contracts will be let soon. The projected route is from Quanah, Tex., southeast via Seymour, Dublin, Austin, Lockhart, Gonzales and Victoria to Rockport, on the gulf coast, about 500 miles. L. E. Walker, president, box 317, Austin, Tex. (April 22, p. 1066.)

Red River Valley & Texas.—Contracts for grading have been let for work on the section from Loveland, Okla., west through Carter and Stephens counties. The projected route is from Ardmore, west to Childress, Tex., about 200 miles. F. L. Mercer, president and general manager, and G. Kenfaver, chief engineer, Davidson, Okla. (March 18, p. 751.)

St. Louis, Iron Mountain & Southern.—Double-tracking work, to cost $770,000, is to be carried out by this company, it is said, on the Arkansas division, from a point north of Little Rock, Ark., just south of Jacksonville northeast to Bald Knob, 47 miles. An additional track will be laid from the White river bridge just south of Newport, north to Diaz, 4.7 miles. Grading contracts said to be let to the Walsh Construction Co., Davenport, Iowa, and to Ball & Peters, Little Rock. Contracts for trestle bridges said to be let to Burke & Joseph, Cape Girardeau, Mo.

Springfield, Nixa & Southern Interurban Railway & Power Co.—Surveys are said to be made for a line from Springfield, Mo., south to the James river, about 19 miles. J Owan, president; W. H. Schreiber, chief engineer, Springfield.

Toledo & Ohio Central.—Surveys are said to be made for a three-mile cut-off to be built at Kenton, Ohio. Contracts for the work are to be let as soon as the plans are completed

Tucumcari & Memphis.—See Chicago, Rock Island & Gulf.

Railway Financial News.

ALGOMA CENTRAL & HUDSON BAY.—The affairs of this company, which is in the hands of a receiver, are to be reorganized under the plan of the Lake Superior Corporation. The $3,000,000 first collateral trust mortgage bonds of the Lake Superior Corporation secured on A. C. & H. B. collateral will be cancelled and the railway company will be recapitalized as follows: 50-year 5 per cent. first mortgage bonds, $6,750,000; 5 per cent. non-cumulative preferred stock, $5,000,000; common stock, $5,000,000. In consideration for a guarantee of principal and interest of the railway company bonds the Lake Superior Corporation will receive the $5,000,000 common stock and will hold $1,125,000 of the preferred stock for the benefit of the railway.

ANN ARBOR.—The company has made a trust agreement securing $660,000 equipment bonds, series A, November 1, 1909, due $33,000 semi-annually beginning May 1, 1910, on 500 steel gondola cars and 300 steel underframe box cars which were ordered from the Standard Steel Car Co., deliverable between October 1, 1909, and February 1, 1910. Of the total cost of the cars, $166,888 was paid in cash.

BUFFALO & SUSQUEHANNA.—Through the application of the United States Trust Co., New York, in an action to foreclose the 4½ per cent. first mortgage bonds of the Buffalo & Susquehanna, H. I. Miller, former president of the Chicago & Eastern Illinois, has been appointed receiver of the Buffalo & Susquehanna. There have been authorized $100,000 receiver's certificates.

CENTRAL OF NEW JERSEY.—Stockholders have approved the guarantee by the Central of New Jersey of the principal and interest of $20,000,000 consolidated 4 per cent. bonds of the Lehigh & Wilkesbarre Coal Co., to be dated June 1, 1910. All but $315,000 of the new bonds will be issued to refund outstanding bonds, and this refunding will effect an annual saving in interest charges of $135,995.

CHESAPEAKE & OHIO.—See Hocking Valley.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—M. E. Ingalls, chairman of the board of directors, is to resign at the next meeting of the board. He is to retain his interest in the road but is forced through ill health to resign his position as chairman.

DELAWARE & HUDSON.—Stockholders are to vote May 10 on the question of amending the sinking fund ordinance so as to permit the sinking fund to be used to pay the cost of the company's increased reserves of coal. Five cents per ton of coal mined has been paid into the sinking fund for about 11 years and about $3,500,000 in all has been paid into the fund. This fund has been used to buy and retire stock, but on December 31, 1909, there was $1,201,538 unspent in the fund. Coal lands bought to increase reserves have cost about $5,500,000, for the purchase of which the company has been reimbursed through the issue of $2,500,000 bonds. This leaves about $3,000,000 yet to be financed.

HOCKING VALLEY.—A temporary injunction has been granted restraining the company from borrowing money to be used to retire the $15,000,000 preferred stock. This injunction was granted in connection with the application of representatives of minority stockholders who are seeking to prevent the sale of control of the property to the Chesapeake & Ohio.

INTERNATIONAL & GREAT NORTHERN.—A protective committee has been formed to look out for the interests of holders of third mortgage bonds. Alvin W. Krech is chairman and E. T. Jeffery and G. P. Butler are the other two members of the committee. The committee represents a majority of third mortgage bonds and ask deposit of these bonds with the Equitable Trust Co. of New York up to and including May 31.

LAKE SUPERIOR CORPORATION.—See Algoma Central & Hudson Bay.

MARYLAND & PENNSYLVANIA.—The bill passed by the Maryland legislature authorizing this company to extend its lines, which now run from York, Pa., to Baltimore, Md., to tidewater, has been signed by the governor. Hambleton & Co., Baltimore, Md., say:

"It would seem that the bill granting the M. & P. the right to extend to tidewater on any route it may acquire, from its present line east of Towson to the east side of the Patapsco river, in Baltimore county, is of very much more importance than would appear on the face of this simple right. In fact, it appears to us that the owners of the M. & P. have obtained the right to a belt line around Baltimore. The connection between the M. & P. and the railway which covers the Canton company's property would give a connecting road between the Baltimore & Ohio, the Pennsylvania and the Western Maryland, and also afford facilities for the Western Maryland to ship its cars by floats from its Port Covington terminal to the terminal at Lazaretto Point." * * *

MISSOURI PACIFIC.—Potter, Choate & Prentice, New York, are offering a block of first refunding 6 per cent. bonds of the Kansas & Colorado Pacific of 1908-1938, guaranteed principal and interest by the Missouri Pacific, at a price to yield about 5.30 per cent. These bonds are part of an authorized issue of $50,000,000, of which $20,687,000 have been issued. Of the bonds issued, $3,972,000 are in the hands of the public and the balance of the bonds are deposited under the Missouri Pacific first and refunding mortgage.

NORFOLK & SOUTHERN.—The United States Supreme Court has denied the petition of the Van Dyke-Zell syndicate for a writ to review the decision of the lower courts affirming the sale of the property on December 7, 1909, to the representatives of the reorganization committee for $8,500,000. This permits of the sale of the bonds of the new company under the reorganization plan.

NORFOLK & WESTERN.—J. B. Thayer, vice-president in charge of traffic of the Pennsylvania Railroad, has been elected a director of the Norfolk & Western, to succeed L. C. Weir, deceased.

PHILADELPHIA RAPID TRANSIT.—Stockholders are to vote June 20 on the question of authorizing an issue of indebtedness from $5,000,000 to $10,000,000. The city council of Philadelphia had previously been asked to authorize a $2,500,000 loan, and an officer of the Transit company says that since it is necessary to call a special meeting of stockholders to act on this $2,500,000 loan, it is thought best to get permission to borrow additional sums if occasion arises, but it is not the intention at present of the company to increase the original sum asked for from the city.

PITTSBURGH & SHAWMUT.—Hallgarten & Co., New York, are offering privately the unsold portion of $3,000,000 first mortgage 5 per cent. redeemable bonds of December 1, 1909-1959, at 94½, yielding about 5.30 per cent. on the investment. The Pittsburgh & Shawmut runs from the southern terminus of the Pittsburgh, Shawmut & Northern at Brockwayville, Pa., to Knoxdale, 37 miles. This road was built in 1908 and is now being extended from Knoxdale to Freeport, 65 miles. Beside being a first lien on the mileage now in operation and on the mileage under construction, the bonds are secured by $11,953,000 Pittsburgh, Shawmut & Northern refunding 4 per cent. bonds and by the entire outstanding $3,607,200 stock of the Allegheny River Mining Co. The total authorized issue of these bonds is $12,000,000.

ST. LOUIS & SAN FRANCISCO.—Speyer & Co., New York, have arranged to buy $7,500,000 general lien 15-20 year 5 per cent. bonds. Of these bonds, $2,000,000 have been sold to French bankers, who previously took a block of the bonds, so that there are now about $10,000,000 bonds placed in Paris. Of the balance of the bonds now sold, a block has been sold to the Deutsche Bank of Berlin.

SOUTHERN PACIFIC.—This company has asked the Texas Railroad Commission for copies of records of value and other data concerning the Texas Central. It is supposed that the Southern Pacific is to take over the Texas Central property in the near future. See an item in General News in regard to this company.

TEXAS CENTRAL.—See Southern Pacific.

Supply Trade Section.

The Hobart Allfree Company, Chicago, has moved its office from 470 Old Colony building to suite 1380 of the same building.

Gerard Van Schaick has been elected president of the W. K. Kenly Company, Chicago, succeeding his brother, A. P. Van Schaick, resigned.

McCord & Co., Chicago, have moved their Chicago office from the Old Colony building to the Peoples Gas building, Michigan avenue and Adams street.

The General Railway Co., Chicago, has moved its Chicago office from the Monadnock building to the Peoples Gas building, Michigan avenue and Adams street.

The Wood Preservers Association announces that the office of F. J. Angier, secretary and treasurer, has been moved to 1033 First National Bank building, Chicago.

The McKeen Motor Car Co., Omaha, Neb., shipped, on April 25, two 55-ft. cars to the North Coast, Spokane, Wash., and one 70-ft. car to the Virginia & Truckee, Reno, Nev.

The Standard Coupler Co., New York, announces the removal of its Chicago office from the Fisher building to 1005 Peoples Gas building, Michigan avenue and Adams street.

The Union Draft Gear Co., Chicago, owing to its greatly increased business has found it necessary to add two private offices to its suite in the Monadnock block. The suite number is now 542-548.

Effective May 1, Arthur P. Van Schaick is appointed district sales agent of the Lackawanna Steel Company, New York, in charge of the Chicago office and territory, succeeding Charles R. Robinson.

Thomas E. Carliss, superintendent Jersey City plant of the Chicago Railway Equipment Co., Chicago, has accepted a position as general superintendent of the Buffalo Brake Beam Co., with headquarters at Buffalo, N. Y.

The Missouri Valley Electric Light Co., Missouri Valley, Iowa, has recently installed a 500-k.w. Westinghouse turbine generator set for furnishing local light and power. The turbine is of the complete expansion type, utilizing steam at 125 lbs. and exhausting into a vacuum of 28 in.

The Standard Steel Car Co., Pittsburgh, Pa., has installed two 500-k.w. low-pressure steam turbines at its Burnham, Pa., plant. These turbines utilize the waste steam of the main equipment and are designed for a vacuum of 28 in., having Westinghouse-Lablanc condensers. The energy thus conserved is applied to two 500-k.w. generators, which furnish light and power for the shops.

F. J. Angier, who recently resigned as manager of the tie and timber department of the Chicago, Burlington & Quincy at Galesburg, Ill., has accepted a position with the Kettle River Quarries Company, with office in the First National Bank building, Chicago. On retiring from the Burlington, Mr. Angier was presented with a set of silverware by the men of the road's tie treating plant at Galesburg.

J. B. Comstock, for six years with the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., at its East Pittsburgh works, and for four years manager of its publication department and printing plant, severed his connections with that company in April to accept a similar position with the P. & F. Corbin Company, New Britain, Conn. Prior to Mr. Comstock's connection with the Westinghouse Company he filled the same position with the Corbin Company as that to which he has recently been recalled to assume.

Butler Keys, for many years with the Consolidated Car-Heating Company, Albany, N. Y., and recently with the Home Rubber Company, Trenton, N. J., has been appointed manager of the sales department of the Hemming Manufacturing Company Garfield, N. J., with headquarters at 2 Rector street, New York. This company owns the Hemming and Gummon patents and has completed a specially designed plant at Garfield, N. J., for the manufacture of fireproof and waterproof molded insulating materials, under these patents.

Jay Robert McColl, for the past five years in charge of the engineering work of the heating and ventilating department of the American Blower Co., Detroit, Mich., has resigned to become a member of the firm of Ammerman, McColl & Anderson, successors to the engineering firm of Brush, Anderson & Ammerman, consulting engineers, Penobscot building, Detroit. Just before entering the engineering department of the American Blower Co., Mr. McColl was a professor of thermodynamics and engineering at Purdue University, and previous to this connection he was a member of the engineering department of the University of Tennessee.

H. Harrison Kress, who has been in charge of the publicity department of the A. S. Cameron Steam Pump Works, New York, has been appointed advertising manager of the Jeffrey Manufacturing Co., Columbus, Ohio. Mr. Kress has been a student of publicity in all its phases for several years and has been active in those organizations which are helping to put publicity work and advertising on a higher plane. At the time of accepting his new position, Mr. Kress was also treasurer of the Advertising Men's League of New York and secretary of the Technical Publicity Association, with which latter organization he will remain as a member of the executive committee.

Frank P. Smith, recently elected vice-president of the Hobart-Allfree Company, Chicago, with office at 30 Church street, New York, began his business career as an oiler on the Mississippi river steamer Savannah, of the Northern Line Packet Company, which plied between St. Louis and St. Paul. His first railway job was as a locomotive fireman on the Iowa and Minnesota division of the old Milwaukee & St. Paul. After serving there and on the St. Paul & Chicago Railroad for three years, he came east to fire on the Panhandle; but in a few months returned west as a fireman on the Indiana division of the Wabash. While on that road he followed the regular routine of six months' service as machinist's helper. He later served successively as locomotive engineer on the Union Pacific; fireman, Rockford, Rock Island & St. Louis (now the St. Louis division of the Burlington); fireman, Wabash; fireman and locomotive engineer, Winona & Minnesota (now Minnesota division of the Chicago & North Western), and engineer on the Wabash, the St. Louis & Iron Mountain, the Chesapeake & Ohio, the Kentucky Central, the Louisville, New Orleans & Texas (now Yazoo & Mississippi Valley), the Louisville & Nashville, the Kansas City, Memphis & Birmingham and the Richmond & Danville (now part of the Southern Railway). Mr. Smith left the Richmond & Danville to return to the Chesapeake & Ohio, but in 1892 entered the employ of C. C. Jerome, Chicago, to sell metallic packing. In October, 1896, he went to the Hancock Inspirator Company and stayed there

Frank P. Smith.

until the end of last year, when he resigned to go with the Hobart-Allfree Company.

H. R. Safford, who has accepted a position as vice-president of the Edgar A. Allen & Company, Sheffield, Eng., with headquarters in Chicago, was born in 1875 and graduated from Purdue University in 1895. He entered the service of the Illinois Central as rodman in 1896 and has been with that company continuously until his recent resignation. He held consecutively the offices of resident engineer, assistant engineer, road master, principal assistant engineer, assistant chief engineer and chief engineer maintenance of way. Mr. Safford is a member of the American Railway Engineering and Maintenance of Way Association and of the American Society of Civil Engineers.

The Isthmian Canal Commission will receive bids until May 26 for its annual estimate for the period ending June 30, 1911, including miscellaneous supplies, such as hand cars, push cars, warehouse trucks, wheelbarrows, jacks, anvils, vises, forges, shovels, spades, picks, hammers, machinists', blacksmiths' and track tools; garden tools, machetes, drills, saws, pipe tools, shears, belt punches, files, scythestones, tool handles; differential, snatch and tackle blocks; wire-rope attachments, sister hooks, hose clamps, brooms, brushes, garbage cans, squilgees, valves, cocks, pipe fittings, cotton mop heads, solder, sash cord, oakum, manila rope, marline, vitrified sewer pipe, brick, fire clay, asbestos cement, rosin, caustic soda, carbolic acid, tie plugs, etc.

John Heman Converse, president of the Baldwin Locomotive Works, Philadelphia, Pa., died at his home in Rosemont, Pa., on May 3, after an illness of but a few days. Mr. Converse was born at Burlington, Vt., on December 2, 1840. He received his early education in the public schools of that town and entered the University of Vermont in 1857, graduating with the class of 1861. After graduation he went into the editorial department of the Burlington (Vt.) *Daily and Weekly Times*, where he remained three years. In 1864 he went to Chicago and worked for two years on the Chicago & North Western. In 1866 he went to the Pennsylvania Railroad at Altoona, Pa., under Edward H. Williams, then general superintendent. In 1870 he secured a position with the Baldwin Locomotive Works through Mr. Williams, who had become one of the proprietors. Three years later he became a member of the firm, in which he has been actively engaged ever since. Mr. Converse was entrusted with the general business and financial management of the company as apart from the mechanical department. In addition to the successful management of the business affairs of this manufacturing business, Mr. Converse has for many years held directorships and taken active parts in the managements of numerous financial and other institutions. Among these are the Philadelphia National Bank, the Philadelphia Trust Co., the Real Estate Trust Co. and the Philadelphia Savings Fund. Since 1899 he has been a member of the board of directors of City Trusts, at first serving at the head of the committee having in charge the Girard estate. He was also a member of the Philadelphia Board of Public Education, president of the Fairmont Park Art Association, trustee of the Presbyterian Hospital and of the Pennsylvania Academy of Fine Arts. During the war with Spain, Mr. Converse served as president of the National Relief Commission organized in Philadelphia. His contributions to churches, charities and various educational and civic institutions have been constant and generous; he had a large and broad sympathy with progressive humanitarian and religious movements. One of the principal buildings of the Presbyterian Hospital in Philadelphia was erected entirely at his expense. He also gave liberally to the University of Vermont, his Alma Mater, of which he was a trustee and to which he has given three buildings. In 1897 the university conferred upon him the degree of LL.D. Mr. Converse's career exemplifies to a marked degree the value of a trained intellect in extensive business affairs and in fidelity in the administration of great trusts. Going to Philadelphia 30 years ago practically unknown, he became one of its foremost citizens. He was a member of the New England Society of Pennsylvania and the Pennsylvania Society of Sons of the Revolution.

J. H. Converse.

In taste, education, experience and general training, Mr. Converse would seem to have been in every way unqualified as an industrial manufacturer, and his entrance into the Baldwin partnership was a surprise to his friends. Nevertheless, he proved to be valuable—almost invaluable—to his associates. He found a sphere of usefulness in the institution because the undertaking was so huge that the conduct and financing of the business afforded scope for all his powers. The partnership, only recently changed to a corporation, undoubtedly built up a kind of friendship, individual respect and loyalty to the name that is quite uncommon in companies. The requirement of unanimous consent in any important action promoted this result. And so it always seemed that Converse, with no knowledge of mechanics, and possibly not all clear as to how a locomotive propelled itself, was apparently the most admiring and enthusiastic partner over the developments and creations of Henszey, Austin and Vauclain.

TRADE PUBLICATIONS.

Copper-Clad Wire.—The Duplex Metals Co., New York, has issued a leaflet regarding the Great Northern's first order for No. 9 B. & S. G. copper-clad wire of 80,000 lbs., and also the same company's 11 repeat orders for this wire, making a total of 912,287 lbs.

Concrete Mixing Machines.—The William B. Hough Co., Chicago, has issued a 24-page booklet of an historical character dealing with the evolution of the Ransome mixer. The first mixer illustrated was built in 1850 by Frederick Ransome and the last is the present machine which was patented in 1907 by A. W. Ransome, a grandson of Frederick Ransome.

Bolt Threading Machines.—The Newton Machine Tool Works, Philadelphia, Pa., in its catalogue No. 46 describes the Newton bolt-threading machines with automatic die heads. The catalogue contains an amount of detail information regarding these machines and also a number of illustrations showing other machines which this company manufactures.

Concrete Mixing Plants.—The T. L. Smith Co., Milwaukee, Wis., has just issued a 24-page booklet illustrating a number of plants designed by contractors and engineers for economically mixing concrete. Construction foremen will find it helpful because of the practical character of the work illustrated. Several of the plants shown are in use on railways, the mixers being mounted on cars.

Steel Sash, Etc.—David Lupton's Sons Co., Philadelphia, Pa., has just issued its catalogue No. 4 covering the following specialties: Lupton steel sash, rolled steel skylight, hollow metal windows, Waldmire louvers, Pond continuous sash and Pond operating device. The catalogue contains a large number of drawings and photographs illustrating these specialties in detail and also in complete installation.

Lifting Jacks.—The Joyce-Cridland Co., Dayton, Ohio, has just issued its new 100-page catalogue A, which contains a list of this company's complete line of jacks for all purposes, and also discussions of the construction and recent improvements in this line of jacks. The relative merits of various types of jacks, such as hydraulic, lever, automatic, automatic geared, screw, telescoping, etc., are also discussed.

Graphite.—The United States Graphite Co., Saginaw, Mich., has issued a general catalog No. 20 giving a brief description of all the company's products. A second publication describes its graphite mines in Mexico. This booklet includes a reprint of the report of Frank L. Hess, of the United States Geological Survey, after an inspection of the U. S. Graphite

Co.'s mines. A number of photographs and maps illustrate the description.

Tractive Power Tables.—The American Locomotive Co., New York, has issued, in its standard size form for loose leaf cover, bulletin No. 1002 containing eight 9½-in. x 14-in. tables of tractive powers of simple locomotives at 100, 150, 160, 180, 190, 200, 210 and 220 lbs. boiler pressure. Several other half and full-page tables and charts are given, the data covering the following subjects: Speed; cylinder volume; interior area, heating surface and weight of tubes; middle ordinates and tangent deflections; metric conversion and locomotive classification tables.

RAILWAY STRUCTURES.

Altamont, Kan.—See Kansas City Union Tractions under Railway Construction.

Baltimore, Md.—Work is to be started at once on the new union passenger station to be built by the Northern Central in Baltimore, and will be pushed as rapidly as possible. It is expected that the improvements will be finished by July, 1911. A large amount of excavation work will be carried out in adjusting the tracks to the proper level for an entrance into the new station. The contract has been given to J. Henry Miller, Baltimore. (April 15, p. 1020.)

Cambridge, Mass.—An officer of the Boston & Maine writes that a contract has been given to Edwards & Monahan for putting up a one-story frame structure, 40 ft. x 756 ft. 6 in., and another 40 ft. x 556 ft. 6 in. at Bridge street, in Cambridge. The buildings are to be tin covered and all doors on the track side provided with Ritter doors.

Conshohocken, Pa.—See Philadelphia & Western under Railway Construction.

Elizabethtown, N. Y.—See Elizabethtown Terminal under Railway Construction.

Jermyn, Tex.—The Gulf, Texas & Western has completed a passenger station, general office building and machine shops at a total cost of $25,000.

Mexico City, Mex.—The National Railways of Mexico is said to be making plans for a large office building and terminal station to be built in Mexico City.

Montreal, Que.—The Grand Trunk Railway agrees to have plans ready by August 1 for a viaduct to be built from Bonaventure station to St. Henri, where the line diverges to the south and east to Wellington street subway. The cost of the improvement is estimated at $8,000,000.

New Richmond, Wis.—See Minneapolis, St. Paul & Sault Ste. Marie under Railway Construction.

Philadelphia, Pa.—An officer of the Philadelphia & Reading writes that a contract has been given to Cramp & Co., Commonwealth building, Philadelphia, for the five-story brick and steel fireproof office building, to be built at Ninth and Spring Garden streets, in Philadelphia. (April 29, p. 1117.)

Savannah, Ga.—Work is to be started at once on improvements to the union passenger station in Savannah. Contracts for the work, which will cost about $20,000, have been let.

Spokane, Wash.—See Chicago, Milwaukee & Puget Sound under Railway Construction.

Topeka, Kan.—The Atchison, Topeka & Santa Fe has let the contract to Bennett & Allen, a local contracting firm, for building the office building mentioned in the *Railway Age Gazette* of November 5, 1909.

Waycross, Ga.—Bids for the construction of the new passenger station in Waycross have been opened by the Atlantic Coast Line, and contract will be let soon. The cost of the improvements will be about $50,000.

Winnipeg, Man.—The Dominion Bridge Co. has been given a contract for building the Lombard street bridge over the Red river in Winnipeg, Man. A contract has also been given to this company by the Canadian Pacific for two new steel bridges. One bridge is to be built at Headingly and the other at Souris. Both bridges will replace the present existing timber structures.

Worcester, Mass.—See Boston & Albany under Railway Construction.

Late News.

The items in this column were received after the classified departments were closed.

The Oregon & Washington is said to be making plans for constructing a large freight yard at Centralia, Wash.

The Ingersoll-Rand Company, New York, announces the removal of its Chicago office from the Old Colony bulding to the Peoples Gas building.

The United States Light & Heating Company, New York, announce the removal of its Chicago office, on May 1, from the Monadnock building to the Peoples Gas building.

At Cincinnati, May 3, Edgar S. Cooke, formerly employed by the Cleveland, Cincinnati, Chicago & St. Louis, was indicted in connection with the embezzlement of which Cashier Warrener was convicted some months since.

After protracted conferences the New York Central has advanced the pay of firemen about 7 per cent. The conference never reached the stage where it was necessary to call in the services of a member of the Grand Lodge of the Brotherhood.

H. G. Selby, commercial agent of the Chicago, Milwaukee & St. Paul, at Buffalo, N. Y., has been transferred to St. Louis, Mo., succeeding J. B. Marshel, transferred, as previously announced in these columns. J. H. Skillen, commercial agent at Pittsburgh, Pa., succeeds Mr. Selby.

The St. Louis, St. Charles & Northern Traction has been organized at Middletown, Mo., to build an electric line from St. Charles, Mo., north via Troy, Olney, Marling, Middletown, Mt. Carmel, Laddonia, Mexico, Paris and points north. C. B. Duncan, president, Olney; E. R. Race, vice-president, Mexico, and C. Pearson, secretary, Middletown.

Rumors from generally well informed sources say that the Chicago, Milwaukee & St. Paul has made arrangements through Kuhn, Loeb & Co., New York, to sell in Paris $50,000,000 bonds, and that the Cleveland, Cincinnati, Chicago & St. Louis is also to sell in Paris $10,000,000 debenture bonds. The Union Pacific, Southern Pacific and Missouri, Kansas & Texas are also now mentioned as possible successful borrowers abroad.

At Mobile on Wednesday 4,200 bales of cotton, consigned to the Elder-Dempster Company by the bankrupt firm of Knight, Yancey & Co., and part of which was stowed in the hold of the steamer Meltonian, was seized by a United States marshal. The court has dissolved the injunction in the case and placed the cotton in the hands of the marshal for disposal. Unless a replevin bond of $300,000 is given by the owners of the cotton it will be unloaded from the steamer. With a view to minimizing frauds in cotton bills of lading the Galveston Cotton Exchange, in a resolution transmitted to the bill of lading conference in Liverpool, urges all bankers and importers to refuse to accept any bills of lading from any port after August 21, 1910, that are not signed by authorized ship agents after the cotton has been delivered into their custody on their wharves.

The United States Steel Corporation has established a pension fund of $8,000,000 which is to be consolidated with the $4,000,000 fund created by Andrew Carnegie several years, and the whole used as a fund to provide for the payment of pensions to disabled or superannuated employees of the corporation. A plan for the relief of men injured and the families of men killed in work accidents while in the employ of the corporation was adopted on April 15, as recently announced. The fund will be known as "The United States Steel and Carnegie Pension Fund," and the net proceeds will be administered by a board of twelve trustees for the benefit of employees of all subsidiary companies of the United States Steel Corporation. Eight of the trustees have been appointed by the corporation and four by Mr. Carnegie.

The Steel Corporation has just increased the wages of its 200,000 employees an average of 6 per cent., the added expenditure for this purpose being about $9,000,000 a year. It has also declared against Sunday work and in favor of giving employees in its manufacturing plants at least twenty-four hours' continuous rest each week.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Cuba Company, New York, will buy from 15 to 20 locomotives.

The Chicago & Eastern Illinois has ordered five six-coupled switchers from the Baldwin Locomotive Works.

The Kansas City, Mexico & Orient has ordered 10 consolidation locomotives from the American Locomotive Co.

The Chicago, Indianapolis & Louisville, reported in the *Railway Age Gazette* of April 29 as negotiating for six consolidation locomotives, has ordered this equipment from the American Locomotive Co.

CAR BUILDING.

The New York, Chicago & St. Louis is building 400 box cars.

Morris & Co., U. S. Stock Yards, Chicago, are in the market for 200 beef cars.

The Long Island has ordered 100 freight cars from the Pressed Steel Car Co.

The Nevada Copper Belt Railway has ordered 50 hopper ore cars from the Pressed Steel Car Co.

The Chicago, Milwaukee & Gary has ordered six caboose cars from the American Car & Foundry Co.

The Cudahy Packing Co., South Omaha, Neb., is in the market for steel tank cars for cotton seed oil.

The Grand Trunk has ordered 1,000 steel underframe box cars from the Western Steel Car & Foundry Co., and 500 automobile cars from the American Car & Foundry Co.

The San Antonio & Aransas Pass, reported in the *Railway Age Gazette* of March 25 as being in the market for 12 caboose cars, has ordered this equipment from the Mt. Vernon Car Manufacturing Co.

The Union Railroad, mentioned in the *Railway Age Gazette* of April 22, in an unconfirmed item, as figuring on 1,000 ore cars, advises that it has under consideration the purchase of 1,000 steel gondola cars.

The St. Louis, Brownsville & Mexico, reported in the *Railway Age Gazette* of March 25 as in the market for caboose cars, has ordered six standard cars of this type from the American Car & Foundry Co.

E. H. Young, Galveston, Texas, has ordered 26 steel underframe tank cars from the German-American Car Company, Chicago. Twenty-three of the cars have a capacity of 8,000 gals., and three a capacity of 7,000 gals.

The Louisville & Nashville, reported in the *Railway Age Gazette* of March 18 as in the market for 1,400 steel underframes, has ordered 700 from the Cambria Steel Co., 500 from the American Car & Foundry Co., and 200 from the Pressed Steel Car Co.

The St. Louis & San Francisco, reported in the Railway Age Gazette of April 8 as figuring on freight cars, has ordered 250 automobile cars from the Standard Steel Car Company and 500 similar cars from the American Car & Foundry Company. Inquiries are now out for 500 box, 500 stock-dump and 250 tank cars.

The Pennsylvania steel passenger car equipment, mentioned in the *Railway Age Gazette* of April 29, and also a number of other steel cars now building in the company's shops, will have the following special equipment:

Axles	5 in. x 9 in. and 5½ in x 9 in.
Bolsters, truck	Pennsylvania steel plate
Brakes	Westinghouse
Brake-beams	7 in. channel
Brake-shoes	Cast-iron steel back
Brasses	P. R.R. type
Couplers	Pitt, McConway & Torley Co.
Curtain fixtures	Curtain Supply Co.
Curtain materials	Mercerized cotton, Pantasote back
Doors	Steel
Door fastenings	P. R.R. type
Draft gear	Westinghouse friction
Draft gear	P. R.R. type
Heating systems	P. R.R. type; P. R.R. C. I. radiators P. R.R. steam 2-in. pipe
Journal boxes	5 x 9 in. and 5½ x 9 in., P. R.R. type

The Virginian has ordered 500 fifty-ton steel gondola cars and 500 fifty-ton steel hopper cars from the Pressed Steel Car Co. The gondola cars will be 40 ft. long, 9 ft. 4 in. wide and 4 ft. 6 in. high, inside measurements, and 41 ft. 5½ in. long, 10 ft. ½ in. wide and 8 ft. 3¼ in. high, over all. The hopper cars will be 30 ft. 11⅞ in. long and 9 ft. 4 in. wide, inside measurements, and 32 ft. 5⅜ in. long, 10 ft. ½ in. wide and 10 ft. 2 in. high, over all. The following special equipment will be used on all cars:

Axles	V. R.R. standard
Bolsters, body and truck	Pressed steel
Brakes	Westinghouse
Brake-beams	Damascus
Brake-shoes	Streeter
Brasses	Magnus Metal Co.
Couplers	Major Buckeye Steel Castings Co.
Draft gear	Farlow-Westinghouse
Dust guards	V. R.R. standard
Journal boxes	Symington, torsion lid
Paint	St. Louis Surfacer & Paint Co.
Side bearings	V. R.R. standard
Trucks	V. R.R. standard, arch bar
Wheels	Cast iron; Central Car Wheel Co.

MACHINERY AND TOOLS.

The Boston & Maine is in the market for machinery for its new shops at Somerville, Mass.

SIGNALING.

Upper right-hand quadrant semaphore signals will be used exclusively for new work and renewals hereafter by the Chicago & North Western both for block and interlocking signals. They will all work in three positions.

An account of the life of the late Henry Johnson, who died on April 5, was published in the *Railway Age Gazette* last week, page 1086. We were unable to get a satisfactory portrait of Mr. Johnson from which to publish an engraving with that article, but, through the courtesy of Sidney G. Johnson, we are able to show herewith a half-tone engraving made from a portrait included in a group which was taken several years ago. This picture, though small, will be recognized as a good likeness of Mr. Johnson in the years when he was in active business.

Henry Johnson.

IRON AND STEEL.

The New York Central is taking prices on 2,500 tons of bridge steel.

The Michigan Central is taking prices on 1,400 tons of bridge steel.

The Minneapolis, St. Paul & Sault Ste. Marie will buy 4,500 tons of structural steel for a bridge over the St. Croix river.

The Chicago, Burlington & Quincy, reported in the *Railway Age Gazette* of April 22 as in the market for 400 tons of bridge steel, has ordered 375 tons from the Pennsylvania Steel Co.

General Conditions in Steel.—As generally happens in the second quarter of the year, the steel industry is experiencing a lull. It is, however, thought that this condition will be but temporary. The present activity of the mills is due to the large tonnage on the books of the various companies. There is a feeling that a good buying movement will set in after some definite assurance is gotten regarding the crop conditions. It is estimated that the earnings of the United States Steel Corporation in April aggregated close to $14,000,000.

The General Electric Company.

The annual report of the General Electric, reviewed elsewhere in this issue, shows that the total area of floor space in buildings and factories of the General Electric was 7,180,000 sq. ft. at the end of 1909, as compared with 7,000,000 sq. ft. floor space occupied at the end of the previous fiscal year. Last year there were 30,000 employees on the pay rolls, as compared with 23,300 the year before. The extensions during the past year and those projected for construction in the immediate future consist principally of buildings for the storage of raw material and finished products. The rapid increase in the number and capacity of hydro-electric properties that has taken place in the last few years gives interest to the statement in the report of Vice-President Rice on manufacturing and engineering that the company's "engineers have improved the design of devices required in such installations which must be capable of successful operation at the enormous pressure of 100,000 volts and over. Such devices consist of switches, transformers, lightning arresters, circuit breakers and insulators, all capable of operating successfully and reliably under the most severe conditions."

The application of 1,200-volt apparatus on interurban railways has steadily increased, and it has been found possible to operate cars on both the 1,200 and 600-volt service. The commercial success of the high-voltage direct-current railway system is ascribed to the inherent simplicity and economy of the system, as well as to the skill of the engineers in installing such systems. More than 66,000 h.p. of 1,200-volt direct-current motors are now in operation or on order. Among the larger railways using this system may be mentioned the Indianapolis & Louisville Traction Company, the Southern Pacific's Oakland, Alameda & Berkeley division, the Washington, Baltimore & Annapolis Electric Railway and the Milwaukee Electric Railway.

Flange Lubricators.

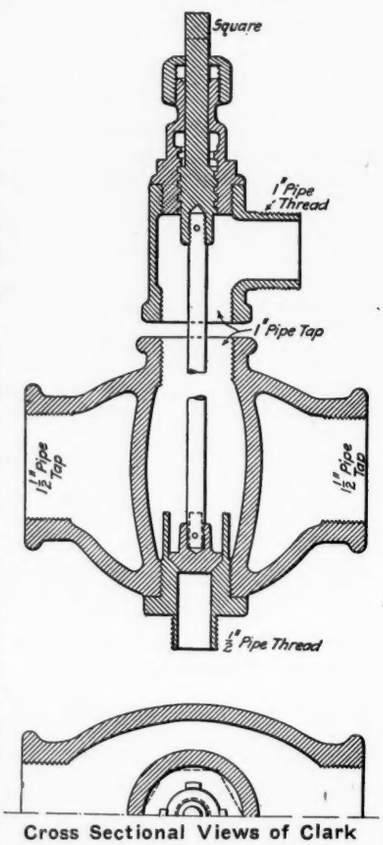
In our issue of March 4, 1910, page 508, we described the Martin flange lubricator, saying that this device had been applied to the forward driving wheels on 69 consolidation engines on the Southern Pacific, and that the results thus obtained were those published in the *Railway Age Gazette* of January 15, 1909, page 119. We were misinformed. J. C. Martin has no contract with the Southern Pacific for the use of his driving wheel flange lubricator. He had simply issued a license in favor of that road and other Harriman lines, granting them the privilege of using it. No Southern Pacific locomotives are equipped with his device. The lubricator referred to in the article published January 15, 1909, mentioned above, is not the Martin patent.

T. F. Bellhouse, Sacramento, Cal., assistant roundhouse foreman of the Southern Pacific, is one of the patentees of a lubricator the Southern Pacific is now using.

Shop Equipment.

Clark Drip Valve for Car Heating.

The drip valve here illustrated is the invention of a conductor on the Grand Trunk Railway, and it has been in successful use for several years. The valve can be placed directly in the steam line or in a branch leading from the steam line and under the car floor. The upper connection is made to the return pipe. The vertical section shows an enlarged cavity, through which live steam circulates on its way through the train line. The inner chamber is closed to live steam and being connected to the return pipe the condensation collects and fills it and the water is kept warm by the surrounding live steam. In this way the drip valve shown at the bottom is always protected against freezing. The valve is opened when the car is being heated at terminals and then closed until sufficient condensation accumulates, so that the temperature of the car is reduced; and the valve is then again opened and all water removed. It is also opened when entering terminals or when steam is cut off more than 30 minutes.



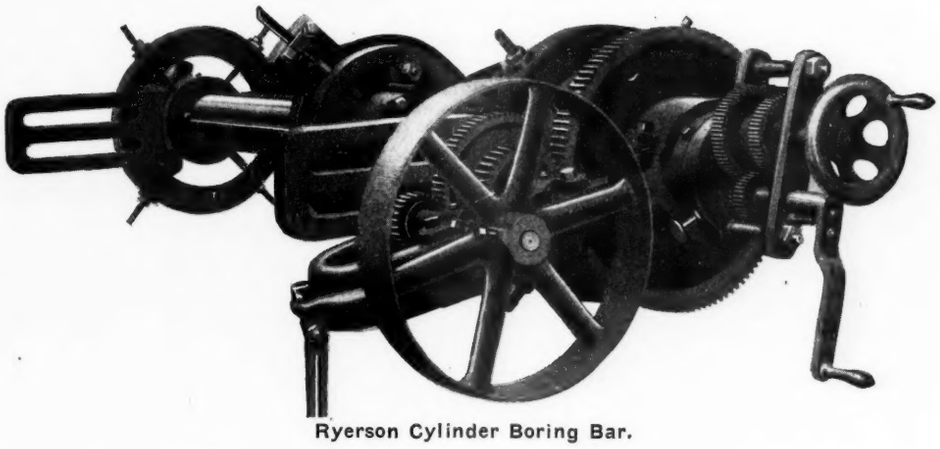
Cross Sectional Views of Clark Drip Valve.

The drip valve is intended to be used in connection with a temperature regulator, or reducing valve, which will limit the amount of steam admitted to the car. The important function of the drip valve is to prevent the waste of steam which ordinarily takes place from open drips which are left open to prevent freezing. The tests of the Clark valve indicate that trains can be successfully heated by a lower train line pressure than is generally used, and a lower pressure will prolong the service of rubber steam hose which is damaged to such a large extent by high-pressure steam. This improved drip valve has been patented by W. T. Clark, room 32, Dearborn station, Chicago.

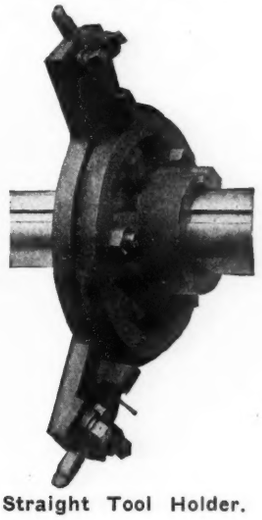
Ryerson Cylinder Boring Bar.

The cylinder boring bar here illustrated was designed by the Ryerson company to meet the requirements of high speed and heavy cuts which are prominent in present day machine shop practice. In addition to being of heavy construction throughout, the new boring bar possesses several features not found in the older types. It has a positive, continuous feed which eliminates the objection to its old star feed, which was intermittent. One of the important features of the improved Ryerson boring bar is that the feed produces a smooth surface throughout the whole cut, as the depth is always uniform. There are two feeds on the No. 1, or 4-in. bar, and three on the No. 2, or 6-in. bar, and a light or heavy feed may be had by merely shifting the gears. The tool holder surface is placed at an angle in the head, thus permitting the use of perfectly straight square cutting tools. With this construction the cylinder can be bored or bushed in the

roundhouse without taking down the guides or removing the back cylinder head. The cutting tool is so firmly clamped that there is no tendency to chatter, which defect is always noticeable in a machine in which crooked or offset tools are used. The different size tool heads may be easily attached. The smallest, or master head, is permanently located on the bar and is so arranged that all the others fit to it positively. The arrangement of the bar head is such that the tool-holding heads can be quickly moved from one end of the bar to the other without the necessity of screwing them laboriously and slowly the full length by hand. The 4-in. bar is arranged to bore cylinders up to 30 in. in diameter and 44 in. long, and the 6-in. bar will bore up to 50 in. in diameter and 35 in. long. When the end of the bar is located in the stuffing box of the back cylinder head these bars will bore up to 50 in. long.



Ryerson Cylinder Boring Bar.



Straight Tool Holder.

Barrett Geared Ratchet Jack No. 400.

The Duff Manufacturing Company, Pittsburgh, Pa., makers of the Barrett jacks, have just placed on the market, through Fairbanks, Morse & Co., Chicago, an improved geared ratchet jack, known as the Barrett jack No. 400. This jack is designed for handling the heaviest loaded freight cars, coaches or locomotives, its lifting power being 40 tons. It is single-acting, raising the load only on the down stroke of the lever. The automatic lowering device is thrown in by a reversing lever, and is dropped out of the way when not in use.

Barrett Geared Ratchet Jack, No. 400.

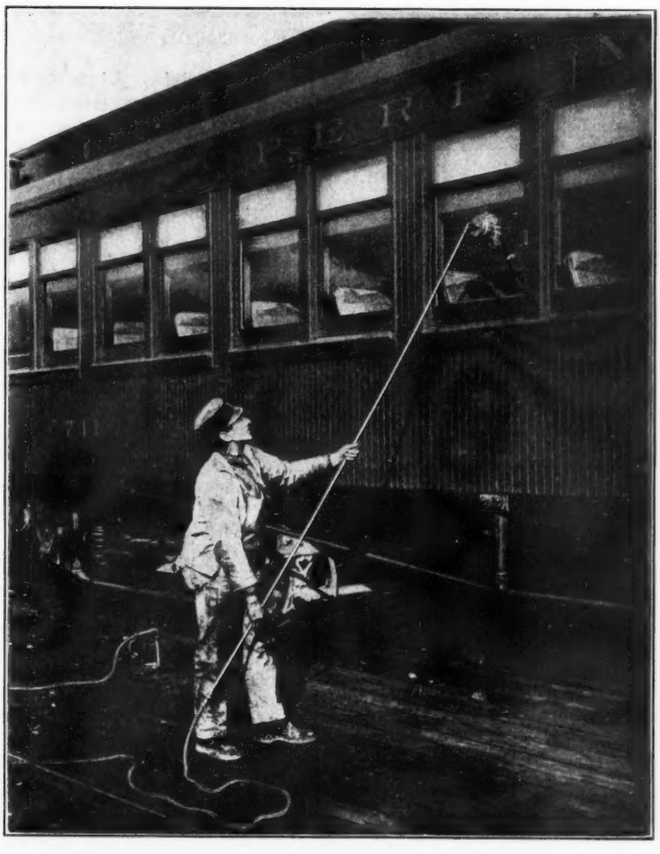
The operation of the jack is as follows: The lifting bar is raised by a hardened steel pinion, which turns on its own bearings in bronze bushings. A large gear is secured on the hub of this pinion and is revolved by a small hardened steel pinion which meshes with it. This small pinion is made of special crucible machinery steel, and revolves on its own bearings in bronze bushings. On the hub of this small pinion is a ratchet mechanism which is turned by a pawl in the socket lever, a retaining pawl also being provided. There is no movement of the lifting pawl in the socket lever, which eliminates wear at that point.

The Duff Manufacturing Company tested these jacks in actual service for about two years before placing them on the market, so that practically all places where wear usually occurs might be protected. All wearing surfaces turn in bronze bearings which are of easy access and may be easily renewed if necessary. Back of the lifting bar or rack is placed a special bronze plate, which can be adjusted to take up any wear that may occur and keep the rack and large pinion in proper mesh.

This jack raises a load of 40 tons to a height of 17 in. It weighs but 275 lbs., so that it may be easily carried from place to place and is convenient to handle. Further details of its construction and use are given in a special bulletin issued by Fairbanks, Morse & Co.

Stanton Coach and Window Cleaner.

The Stanton window washer which was described in the *Railway Age Gazette* of April 1, has also been used for washing coaches on 70 steam and electric lines. The results obtained are said to be better than by the older methods, as the grit and dust are flushed off and not scoured off, all pol-

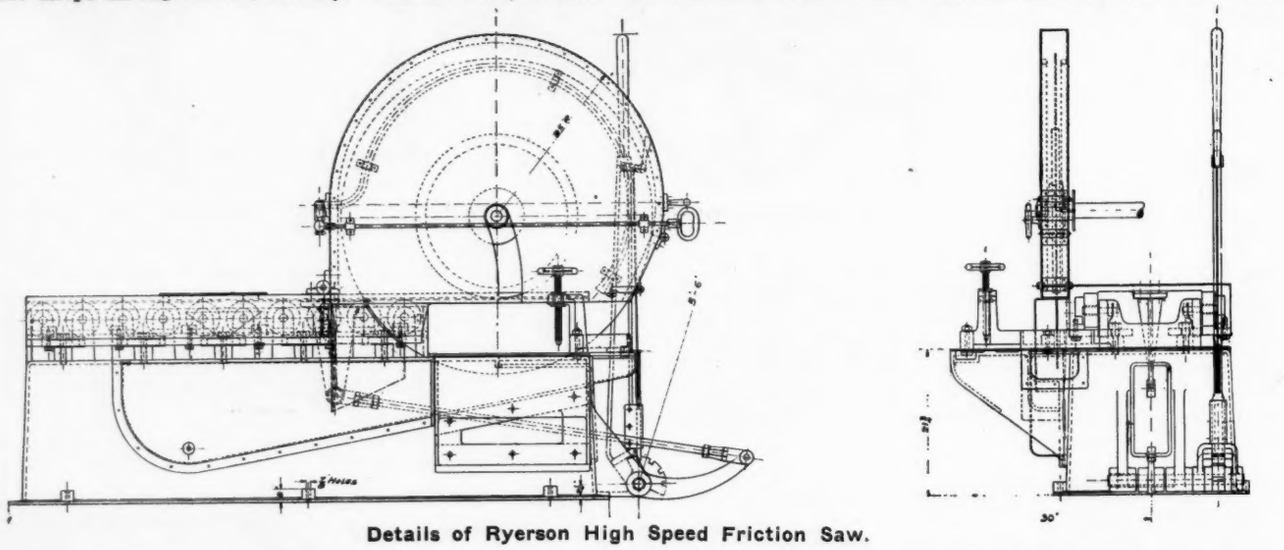


Coach Window Washing with Stanton Cleaner.

ished surfaces being left in good condition. Window casings, transoms and all corners can be easily cleaned with this device, for an abundance of clean water is sprayed through the brush by a patent sprayer, as described in the former article. The brushes and handle are made of the best material so that repair costs are small. The use of this device reduces the necessary labor, and it is claimed that there is enough saving to pay for the cleaner in a few days. The device is handled by Geo. R. Stanton, 1302 West Main street, Decatur, Ill.

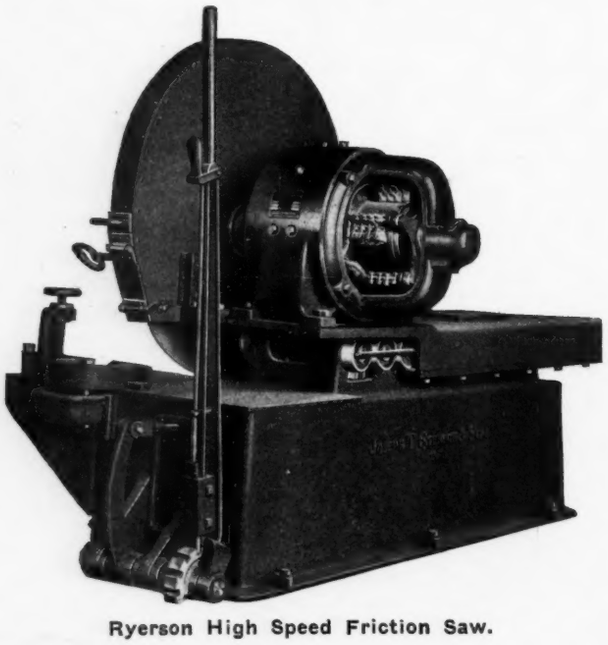
Ryerson High Speed Friction Saw.

The high speed friction disk is the most rapid and efficient machine for cutting steel shapes, and it is now extensively used at the large steel mills and the principal structural and car shops throughout the country. This machine, as built heretofore, is heavy and expensive, requiring high power motors, massive foundations and supplementary equipment, entailing a cost of nearly $5,000. This high cost has prevented the general introduction of these machines in the average sized car shop, and the experience of the Ryerson company in installing car shop equipment has shown the necessity of a lighter machine, which would be compact, self-contained and lower in first cost and maintenance. This company has been experimenting for some years with the idea of producing such a machine, and it has now placed on the market the high-speed friction saw, which we here illustrate.



Details of Ryerson High Speed Friction Saw.

It has a capacity to cut continuously 15-in., 80-lb. beams in 28 to 30 seconds, and occupies a floor space 7 ft. x 4 ft., no foundation other than a good floor being necessary. The motor is 52 h.p., with special design as to winding. The saw blades, or disks, vary in diameter from 44 in. to 52 in., depending on the current and the voltage of the motor. They are held firmly in place by hollow steel collars which extend to within 8½ in. of the edge. The blade revolves in a steel hood having perforated pipes connected with the water supply controlled by a valve at the rear of the hood, so that water is only used during the actual time of cutting. The motor and saw are mounted on a strong trough-shaped casting which travels on roller guides arranged both horizontally and vertically. These are plainly shown in the illustration. The carriage is arranged so that small beams and other shapes may be cut on a bevel or miter at any desired angle. For such mitering there is a swinging clamp on the table on which an arc is described. This miter feature of a friction saw is entirely new, as no other saws have been built in this way. With this saw it is unnecessary to clamp the work down when straight cutting is done. There are no adjustments or feeds to watch or regulate, and the machine may be used in rapid succession on beams, angles, channels, tees or rails with no change or adjustment.

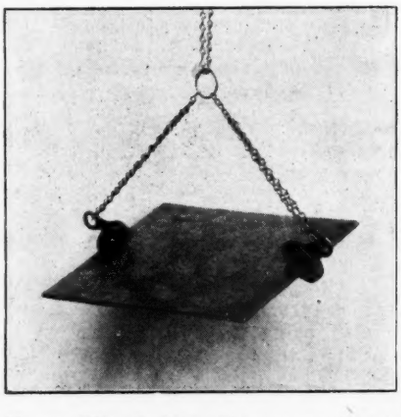


Ryerson High Speed Friction Saw.

The high-speed friction saw is manufactured and sold by Joseph T. Ryerson & Son, Sixteenth and Rockwell streets, Chicago.

Never Slip Safety Clamp.

The accompanying illustration shows a new design of clamp for handling sheet iron in shops. The clamp is designed to firmly grip the plate and prevent its slipping out and falling during transit by an overhead crane. This precaution is especially necessary in shops where plates are transferred about the building and over the workmen.



Never Slip Safety Clamps as Used.

The clamp is made of forged steel to give it the greatest possible strength. There are three sizes, adapted for carrying sheets up to 2 in. in thickness. Close inspection of the clamps in the photograph shows that the weight of the sheet acts to force the holding teeth of the movable dogs into the sheet, gripping it firmly. This clamp is made by the Never Slip Safety Clamp Co., New York.